

SOIL SURVEY

Towns County Georgia

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In cooperation with the
UNIVERSITY OF GEORGIA, COLLEGE OF AGRICULTURE
and the
TENNESSEE VALLEY AUTHORITY

How to Use THE SOIL SURVEY REPORT

FARMERS who have worked with their soils for a long time know about the soil differences on their own farms, perhaps also on the farms of their immediate neighbors. What they do not know, unless soil surveys have been made, is how nearly their soils are like those on experiment stations or on other farms either in their State or other States where farmers have gained experience with new or different farming practices or farm enterprises. They do not know whether higher yields obtained by farmers in other parts of their county and State are from soils like theirs or from soils so different that they could not hope to get yields as high, even if they followed the same practices. To know what kind of soil one has so that it can be compared with those on which new developments have proved successful is a means by which some of the risk and uncertainty can be taken out of trying new methods and new varieties.

SOILS OF A PARTICULAR FARM

The soil map is in the envelope inside the back cover. To find what soils are on any farm or other tract of land, the tract must first be located on the map. This is easily done by using such landmarks as roads, streams, villages, dwellings, and other features that help to locate the boundaries.

Each kind of soil mapped within the farm or tract is marked on the map with a symbol. All the areas marked "Tx" are Toxaway silt loam. The color with which the soil area is shown on the map will be the same as the color in the legend.

To find out what the soil is like, turn to the section on Soil Series, Types, and Phases and find Toxaway silt loam. There will be found a statement of what the soil is like, what it is mainly used for, and some of the uses to which it is suited.

How productive is Toxaway silt loam? Find this soil in the left-hand column of table 16 and read the yields given opposite it under the names of different crops. This table also gives estimated yields for all the other soils mapped in the county.

What are considered good uses and management practices for Toxaway silt loam? Read what is said about this soil in the section on Soil Series, Types, and Phases. Look also at the section headed Land Use and Soil Management. Here the soils suited to the same use and management practices are grouped together. Read what is said about crops, crop rotations, liming, fertilizing, drainage, erosion control methods, and other management practices for this group of soils. It will apply to Toxaway silt loam.

SOILS OF THE COUNTY AS A WHOLE

A general idea of the soils of the county is given in the introductory part of the section on Soils, which tells about the principal kinds of soils in the county, where they are found, and how they are related to one another. Study also the soil map and read the section on Soil Associations. Notice how the different kinds of soils tend to be arranged in different parts of the county. These patterns are likely to be associated with well-recognized differences in type of farming, land use, and land-use problems.

A newcomer to the county, especially if he considers purchasing a farm, will want to know about the climate; the types and sizes of farms; the principal farm products and how they are marketed; the kind and conditions of farm tenure, including tenancy; kinds of farm buildings, equipment and machinery; churches, schools, roads, and railroads; the availability of telephone and electric services and water supplies; the industries of the county; and the cities, villages, and population characteristics. Information about all these will be found in the section on General Nature of the Area and in the section on Agriculture.

Those interested in how the soils of the county were formed and how they are related to the great soil groups of the world should read the section on Morphology and Genesis of Soils.

This publication on the soil survey of Towns County, Ga., is a cooperative contribution from the—

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SOIL SURVEY OF TOWNS COUNTY, GEORGIA¹

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United States Department of Agriculture in cooperation with the University of Georgia, College of Agriculture, and the Tennessee Valley Authority

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¹ Report revised by R. C. JURNEY, Division of Soil Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering.

^{1a} The Division of Soil Survey was transferred to Soil Conservation Service on Nov. 15, 1952.

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TOwNS COUNTY lies in the highlands of north Georgia. The elevation ranges from about 1,800 feet on the valley floors to 4,768 feet on the highest mountain peak. Its continental climate is characterized by moderate summers, mild open winters, and a well-distributed rainfall. Agriculture, the principal industry, consists chiefly of the production of subsistence crops and the raising of cattle and hogs. Corn, small grains, and hay, including soybeans cut for hay, are the principal field crops. Potatoes, sweetpotatoes, truck crops, sorghum for syrup, and tobacco are grown to a fairly large extent. Every farm has some chickens. Forest products, including those obtained under contract from national forest land, afford cash incomes for many farmers. A few persons find employment in the local sawmills, but there are no other industries. To provide a basis for the best agricultural uses of the land this cooperative soil survey was made by the United States Department of Agriculture; the University of Georgia, College of Agriculture; and the Tennessee Valley Authority. Field work was completed in 1939, and unless otherwise specifically mentioned, all statements in this report refer to conditions at that time.

GENERAL NATURE OF THE AREA

LOCATION AND EXTENT

Towns County is in the northern part of Georgia (fig. 1). The county is irregular in outline, and with few exceptions its boundaries follow mountain ridges. Wolfpen Ridge constitutes most of the western and the Blue Ridge most of the southern and southeastern boundaries. Hiwassee, the county seat, is 90 miles northeast of Atlanta, 145 miles north of Macon, and 145 miles northwest of Augusta. The county occupies a total land area of 103,680 acres, or 162 square miles.

PHYSIOGRAPHY, RELIEF, DRAINAGE, AND WATER SUPPLY

Towns County is in the highlands of north Georgia, which are a southern extension of the Appalachian Mountains (9).² Throughout the uplands the topography ranges from rolling to mountainous. Rolling relief with elevations to 2,100 feet is characteristic of the Hiwassee Plateau (pl. 1, A). At greater elevations slopes are steeper and there is little rolling or gently sloping land. In addition to the nearly level and generally narrow first bottoms near streams, three terrace systems are evident. The most recent terraces, low lying and in places only slightly above the first bottoms, are narrow, nearly level, and subject to frequent overflow. The intermediate ones are characterized by gently sloping to sloping surfaces, and some are inundated by floods, even though they are higher than the recent ones. The highest terraces are apparently much older than the others; their

² Italic numbers in parentheses refer to Literature Cited, p. 120.

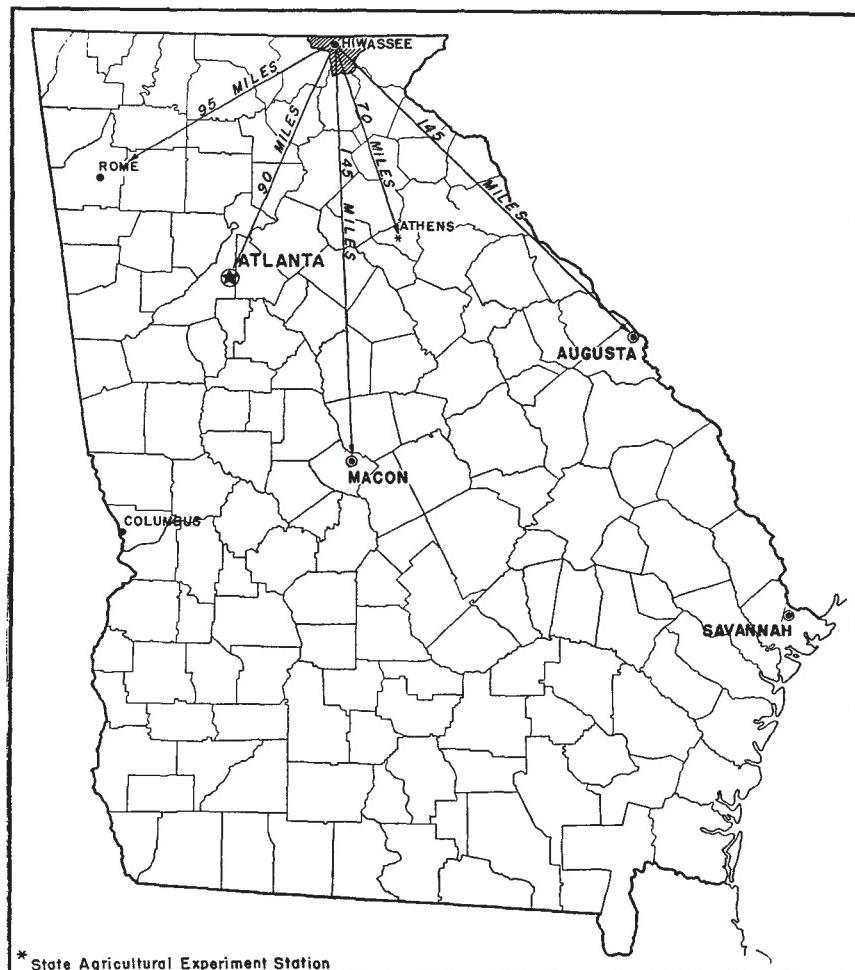


FIGURE 1.—Location of Towns County in Georgia.

relief ranges from gently sloping to very strongly sloping and is especially strong in fringes next to the uplands.

Schist and gneiss of the Carolina series³ underlie most of the county. In general the outcrops on the higher ridges are granite-gneiss, and on the lower elevations, micaceous schist. Narrow strips of basic rocks, mainly hornblende gneiss, are exposed in many places, principally on the east slope of Long Ridge near the headwaters of Sunnyside Branch. The general direction of these outcrops is from northeast to southwest. There are also many narrow exposures of muscovite-biotite granite, muscovite-biotite pegmatite, and veined quartz, especially in locations where micaceous schist predominates. Residuum of quartz gravel occurs on most of the stream-cut terraces. Small deposits of vermiculite are along Scataway Creek and at Lemons Gap (11).

³ Data furnished by Richard Smith, State geologist.

Elevations range from less than 1,800 feet where the Hiwassee River crosses the Georgia-North Carolina boundary to 4,768 feet on Brasstown Bald, the highest mountain in the State. Elevations along Blue Ridge and on Wolfpen Ridge are for the most part considerably more than 3,000 feet. The elevation at Hiwassee is 1,963 feet, and at Young Harris, 1,928 feet. Most of the land used for cultivated crops lies at elevations of less than 2,200 feet.

Differences in elevation result largely from differential weathering and wearing down of rocks of variable resistance and from the position of any particular area in relation to streams. The wearing away of the surface is greatest near the large streams and least around their headwaters, and because of this there are plateaus and open valleys near the large rivers and mountainous land near the divides between the rivers (9).

Most of the drainage finds outlets to the Hiwassee River, which rises within the county, flows northwestward, and ultimately joins the Tennessee River. An area of about 10 square miles beyond the Blue Ridge in the northeastern part drains into streams forming the headwaters of the Tallulah River. The water of this river flows southeastward into the Tagaloo River, then into the Savannah River, and eventually into the Atlantic Ocean. An area of about 3 square miles in the southwestern part drains into the Chattahoochee River, which enters the Gulf of Mexico.

The Hiwassee Plateau, a well-defined feature in the county, borders the Hiwassee River. It reaches its greatest width along the Georgia-North Carolina boundary, from which point it fans out along Brasstown, Wood, and Bell Creeks. Southward from Hiwassee the plateau converges sharply into narrow strips, which are cut by the Hiwassee River and Hightower Creek. The Hiwassee River is entrenched to a depth of 200 to 300 feet and is well graded within the plateau, but tributaries beyond the limits of the plateau have irregular gradients, with rapids and waterfalls. Power developed by the river and its tributaries is utilized in various parts of the county for running small mills.

The drainage pattern is dendritic. There is no swampy land on the uplands, but in first bottoms some of the land is semiswampy or otherwise poorly drained. Chatuge Reservoir (pl. 2), on the Hiwassee River, lies partly within Towns County. Because of its strategic location, Chatuge Lake substantially supports business and agriculture by providing fishing and other recreation. Considerable tourist trade from metropolitan centers such as Atlanta centers around this lake.

The water supply for livestock, obtained from the many streams and springs, is adequate except during prolonged dry weather. Water for domestic use is obtained from springs, shallow wells, and streams (9).

CLIMATE

The county has a continental climate and is in the second heaviest rainfall belt in the United States. Summers have moderate midday temperatures and generally cool evenings; winters are mild and open, and the periods of cold weather are short and erratic.

Official records of local variations in temperature are not available, but so far as is known, the lowest minimum temperature and lowest

average temperature occur on the mountains where elevations commonly range from 3,300 to 4,768 feet, rather than on the Hiwassee Plateau, which at its highest point is only 2,100 feet. Convection currents of cool air from the higher slopes probably account for the cool evenings in summer. The mean annual temperature at the weather station in Dahlonega, Lumpkin County, Ga., where climatic conditions are similar to those of Towns County, is 59° F., and the difference between the winter mean and the summer mean is 32.6°. This weather station is about 47 miles southwest of Hiwassee and at an elevation of 1,519 feet.

A close correlation exists between elevation and mean precipitation. Records kept for a 3-year period on three rain gages located at elevations of less than 2,100 feet in widely separated parts of the county show an average precipitation of 55.64 inches. Similar records for stations at elevations above 2,100 feet show an average of 63.81 inches, or 8.17 inches greater.⁴ This relation is brought out better by data kept on 14 rain gages in both Towns and Union Counties. The 7 stations located below an elevation of 2,100 feet showed an average rainfall of 52.78 inches, and the 7 stations located above that elevation had an average of 65.21 inches, or 12.43 inches greater.

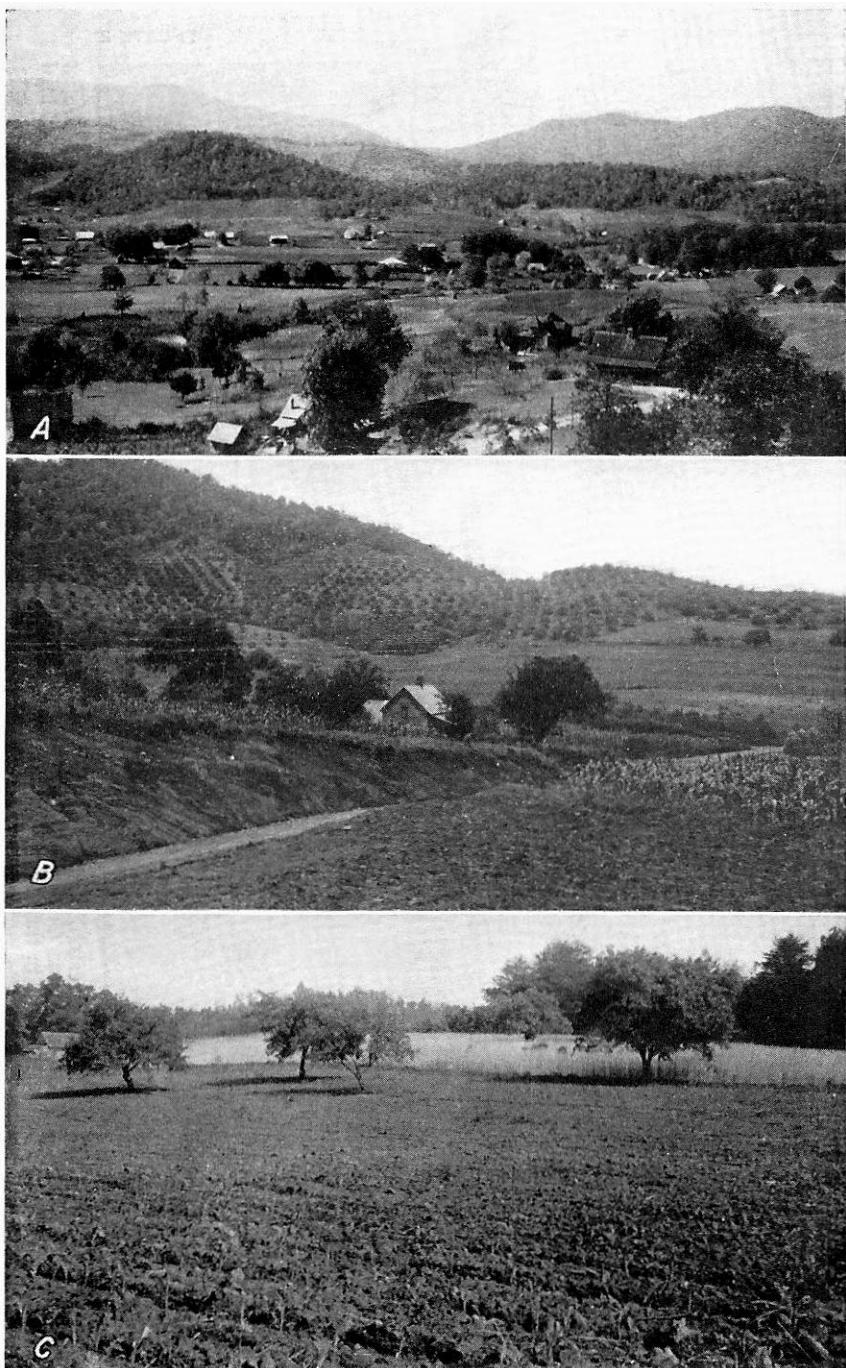
Direction of slope and other variations in lay of the land, differences in elevation, and proximity and relation to mountains apparently affect both air drainage and precipitation. Heavier frosts occur more frequently in valleys or depressions than on surrounding higher slopes, and at the lower elevations growing vegetation is injured by frost at an earlier date. Temperatures on north-facing slopes are lower, and largely because of this, fruit trees planted on them remain dormant longer than on south-facing slopes and are less likely to be injured by frost in late spring. Also the soils on the north-facing slopes are less intensely oxidized in many places and have a higher organic-matter content. Damage to small grain and other crops by soil heaving and attendant winterkilling is greatest on seepy lower slopes and other places where the humidity is high. Nonetheless, in the frost-free season, these same places may be especially well suited to lettuce, cabbage, and such leafy truck crops, provided soil characteristics and other factors are favorable.

The average frost-free season extends from April 10 to October 26, a period of 200 days, but killing frost has occurred as late in spring as May 10 and as early in fall as October 7. The grazing season continues from about April 15 to about December 15.

Although official records at Dahlonega, Lumpkin County, show an absolute minimum temperature of -11° F., subzero weather is unusual. Cold periods are brief and are disagreeable chiefly because of high humidity. The winters are for the most part sufficiently open to permit outdoor work. The snowfall is too slight to provide a deep cover, but few small-grain and clover crops are winterkilled on the better drained soils. Winter vegetables other than turnips and onions are not ordinarily grown.

The rainfall is unusually well distributed and sufficient to meet the moisture requirements of the most exacting crops where the lay of the

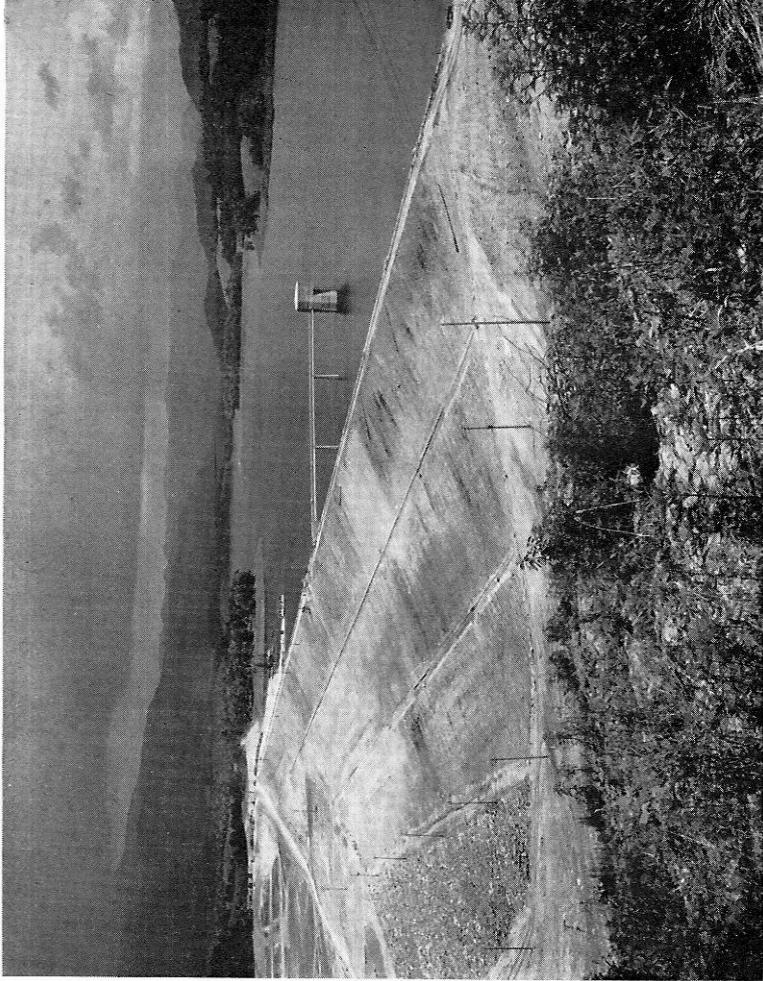
⁴ Data supplied by James Smallshaw, area engineer, Tennessee Valley Authority, Murphy, N. C.



A, Hiwassee Plateau, predominately Hayesville soils, cleared for crops and pasture; steep mountainous land in background is chiefly forested Porters soils.

B, Hayesville soils: Comparatively smooth land in foreground moderately well suited to general farming; land in the steep background satisfactory for apples, peaches, and like tree fruits if air, drainage and exposure are favorable.

C, Corn and rye on Hayesville clay loam, eroded rolling phase.



About one-half of Chatuge Reservoir, established on the Hiwassee River by the Tennessee Valley Authority, lies in Towns County. Hayesville soils predominate on the surface of the foreground and Porters soils in the distant mountainous background.

land, internal soil characteristics, vegetative cover, and such conditions are favorable. Crop yields, however, are sometimes materially reduced during periods of light rainfall, particularly on clean-cultivated slopes where the runoff of rain water is excessive or in places where the moisture-holding capacity is limited by shallow soil over bedrock or by a tight impervious subsoil or substratum. Variations in rainfall from year to year are so small that they barely affect agriculture. Destructive hailstorms, high winds, and tornadoes rarely occur.

On a few farms surface water is occasionally used to irrigate home gardens and small areas of lettuce, cabbage, potatoes, and such crops, particularly if they are grown for market late in summer or in fall.

Data on normal monthly, seasonal, and annual temperature and precipitation compiled from records of the weather station at Dahlonega, Lumpkin County, Ga., are given in table 1.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Dahlonega, Lumpkin County, Ga.*

[Elevation, 1,519 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total for the driest year	Total for the wettest year	Average snow-fall
December---	° F. 42. 5	° F. 71	° F. 1	Inches 7. 19	Inches 5. 45	Inches 3. 06	Inches 0. 8
January-----	41. 5	72	-1	5. 51	3. 25	6. 81	1. 6
February-----	43. 0	76	-11	5. 86	4. 43	7. 97	1. 8
Winter-----	42. 3	76	-11	18. 56	13. 13	17. 84	4. 2
March-----	50. 8	88	0	6. 01	3. 96	11. 54	. 6
April-----	58. 6	92	23	4. 54	2. 55	7. 19	(¹)
May-----	66. 5	95	30	4. 89	3. 96	9. 23	0
Spring-----	58. 6	95	0	15. 44	10. 47	27. 96	. 6
June-----	73. 6	101	39	4. 72	1. 32	4. 31	0
July-----	76. 0	101	50	5. 63	2. 32	3. 52	0
August-----	75. 1	102	49	5. 05	8. 76	4. 05	0
Summer---	74. 9	102	39	15. 40	12. 40	11. 88	0
September---	70. 5	99	34	4. 37	. 51	14. 49	0
October-----	59. 8	89	21	3. 89	(¹)	2. 84	(¹)
November-----	49. 7	79	10	3. 62	2. 71	11. 11	. 2
Fall-----	60. 0	99	10	11. 88	3. 22	28. 44	. 2
Year----	59. 0	102	-11	61. 28	² 39. 22	³ 86. 12	5. 0

¹ Trace.

² In 1904.

³ In 1929.

VEGETATION

The forest association in the highland region is composed of chestnut, chestnut-oak, and yellow-poplar. Although these are the characteristic species distinguishing this forest from that of the hardwood belt to the west, there are many other kinds of trees included. The region probably contains a larger number of species than any other in North America (12). In the original forest chestnut was especially conspicuous; yellow-poplar was common in the more moist situations; and white pine and hemlock were common at high elevations.

Various species of oaks predominate in the present cut-over forest. Most of the original yellow-poplar has been removed, and most of the chestnut not cut for lumber has been killed by blight. Abandoned fields are taken over first by broomsedge, and later by smilax and blackberry. These plants are then crowded out by shortleaf or Virginia pines, which are followed by oaks and other deciduous trees that make up the climax forest.

ORGANIZATION AND POPULATION

Most of the area now comprising Towns, Union, and Fannin Counties was a part of the lands ceded to the United States by the Cherokee Indians in 1832. That same year the area was organized into Union County (4). The early settlers were principally of Scottish, English, and Irish descent and they came chiefly from earlier settlements in North Carolina.

In 1856, Towns County was organized as a separate unit; and on the 9th of October that same year the county commissioners purchased 30 acres from H. E. Watson to be used as the town site of Hiwassee. A little later land in the northeastern part of the present county, or an area comprising most of the Militia Districts 1264 and 1518, was annexed from Rabun County.

In 1950 the county had a population of 4,803, all classified as rural. The density of population was 28.9 persons a square mile. Settlement is greatest on the rolling uplands of the Hiwassee Plateau and in narrow valleys in the mountains. Large tracts on mountainous land, held chiefly by the United States Forest Service, are uninhabited. Hiwassee and Young Harris, the only towns in the county, had populations of 375 and 450, respectively, in 1950. Both towns were incorporated.

TRANSPORTATION, MARKETS, AND INDUSTRIES

No railroad enters the county, and the nearest rail shipping point is Hayesville, N. C., 8 miles north of Hiwassee. Hard-surfaced roads passing through Blairsville, Ga., connect Hiwassee and Young Harris with Atlanta and other outside markets. Other improved roads in the process of being hard-surfaced connect these towns with Clayton, Ga., through Dicks Creek Gap, and with Gainesville, Ga., through Unicoi Gap. A few other roads are improved, but many are not.

Hiwassee and Young Harris are the principal markets and buying centers for surrounding rural districts. A few small stores and grist-mills located at convenient places in the county carry on local business. Cabbage, snap beans, lettuce, potatoes, and such market crops are transported by motortruck to Atlanta.

Aside from the work afforded in the Chattahoochee National Forest and the various small sawmills throughout the county, there is little demand for any other than farm labor. All industries are local and not nearly so important as agriculture.

CULTURAL DEVELOPMENT

Churches are conveniently located in different parts of the county. All sections have elementary schools, and secondary-school pupils are transported to a central high school in Hiwassee. Opportunity for higher education is offered by Young Harris College, a Methodist denominational junior college.

AGRICULTURE

AGRICULTURAL HISTORY

The earliest recorded agriculture in the area now occupied by Towns County was carried on by the Cherokee Indians. This advanced tribe maintained a capital at New Echota (near Calhoun in Gordon County, Ga.) and published a paper in the Cherokee language there (6). The Cherokees had semipermanent homes and developed a limited self-sufficient type of agriculture. Horses and, later, oxen were used as beasts of burden. The cultivated crops—grown chiefly on soils of first bottoms and terraces—were mainly corn, beans, potatoes, and such food crops but a little tobacco was also grown. These crops together with persimmons, grapes, papaws, mulberries, mayapples, blackberries, strawberries, plums, and other wild fruit were produced in small quantities; and fish and game provided a standard of living adequate for the simple tastes of the Cherokees.

After the discovery of gold in the southern part of the Appalachian Mountains in 1830, the pressure of white immigration became great, and in 1836 the Cherokee Indians were removed and the land was open for settlement.⁵ Settlement was rapid, but unlike the Indians, who had free choice, the white settlers were assigned their land by lottery. They received tracts of 160 or 400 acres, depending on the pattern of the survey, and in consequence many farms were established in remote locations or on steep mountainsides. Many of the first settlers were interested in gold rather than in agriculture. Difficulties in transportation, crude farming implements, and steep hillside fields precluded the production of large quantities of farm produce for distant markets. Most of the people who settled in the area had limited means, and of necessity they attempted to use the land drawn by lottery, even if it were undesirable.

As a result of the lottery method of settling, the early settlements were much more widely distributed over the county than they would have been under a carefully planned program, and land abandonment began within 15 years after the initial settlement of the territory in which Towns County is now located. In 1849 the roads were rough and in many places bridges were lacking (14).

Because transportation facilities were lacking and markets were remote, commercial cutting of timber followed rather than preceded

⁵ In Union County, from which Towns County was taken, settlement and legal private ownership of land started in 1832.

agricultural development of the land. Commercial lumbering operations in Union County began in 1895, or 65 years after the initial settlement. In Towns County, formed from Union County, commercial lumbering began some time after 1895.⁶ In 1925 a part of the county was included in a newly organized national forest, the boundaries of which were later extended to include nearly 80 percent of the county. Not all the land within the forest is owned by the Government, but large areas formerly settled now contain no permanent dwellings. The national forest was largely culled of poplar, ash, basswood, cucumber tree, and maple before Federal purchase, but some virgin stands remain. Because blight has killed the chestnut trees that constituted about 45 percent of the original forest stand, most of the forested lands are understocked. With the exception of old-field stands of shortleaf pine or Virginia pine that now cover abandoned home sites in the larger coves, the majority of the stands contain two or more age classes.

Present-day agriculture is limited mainly to the production of field crops and livestock. Corn is the most important field crop, and hay is fairly important. Some wheat, oats, rye, and soybeans are grown. The acreage of tobacco is small. Vegetables and fruits are grown mainly for home use. Cattle, hogs, and chickens provide food for home use and are also a source of cash income. Forest products are sold from a relatively small number of farms.

CROPS AND FOREST PRODUCTS

The acreage of the various crops has fluctuated. Between 1919 and 1944, there was a large decrease in acreage of wheat, rye, tobacco, corn for grain, and sweet sorghums for sirup, but an appreciable increase in hay. Corn, the principal crop in acreage and production, decreased 2,787 acres between 1919 and 1944. In the same period, wheat dropped from 2,050 to 450 acres. These variations and changes are indicated in table 2, where acreages of principal crops and the number of fruit trees and grapevines are given for stated years.

The proportionate acreage in corn and in small grains has also varied. In 1919, 48.6 percent as much land was planted to small grains as to corn. Probably this resulted because of high prices for grain following World War I. In 1929, 26.3 percent as much land was in small grains as was in corn, but in 1939 the small grain acreage increased to 38 percent of the acreage in corn. This increase was partly the result of extension service programs emphasizing increased plantings of cover crops and more diversified farming. In 1944, the acreage of small grains dropped to 21.8 percent of the corn acreage.

The average yield of wheat in the 1919-44 period was 10.3 bushels an acre; and in the same period, the average yield of oats was 16.6 bushels. The yield of corn varied from 8.3 bushels an acre in 1919 to 29 bushels in 1944. Yields of corn have increased since 1944, chiefly because of the use of complete fertilizer and agricultural limestone.

Hay is grown on about one-fourth of the farms in the county, and in 1944 the total production was 950 tons. Lespedeza ranked first,

⁶ Data obtained from W. H. Fisher, forest supervisor, Chattahoochee National Forest.

TABLE 2.—*Acreage of principal crops and number¹ of bearing fruit trees and grapevines in Towns County, Ga., in stated years*

Crop	1919	1929	1939	1944
	Acres	Acres	Acres	Acres
Corn for grain.....	8,327	7,786	6,313	5,540
Oats.....	76	16	² 17	70
Wheat.....	2,050	980	678	450
Rye.....	1,928	1,066	1,731	790
Peas.....	³ 33	³ 25	⁴ 17	⁴ 22
Soybeans.....	(⁵)	31	140	985
All hay.....	332	456	828	787
Timothy and clover, alone or mixed.....	(⁵)	5	30	16
Clover alone.....	(⁵)	26	(⁵)	(⁵)
Alfalfa.....	(⁵)	(⁵)	7	(⁵)
Lespedeza.....	(⁵)	(⁵)	362	730
Legumes cut for hay.....	283	86	356	(⁵)
Other cultivated grasses.....	(⁵)	303	33	41
Wild grasses.....	49	36	40	(⁵)
Forage (coarse).....	7,808	32	(⁵)	(⁵)
Potatoes.....	123	144	216	192
Sweetpotatoes.....	77	91	121	90
All other vegetables.....	20	6	(⁵)	(⁵)
Tobacco.....	10	4	8	2
Sweet sorghums for sirup.....	437	60	74	(⁵)
	Number	Number	Number	Number
Apples.....trees	17,721	14,994	13,252	12,196
Peaches.....do	2,918	2,372	1,971	138
Pears.....do	200	69	95	43
Plums and prunes.....do	1,138	307	99	9
Cherries.....do	(⁵)	221	956	461
Grapevines.....	318	26	263	1,114

¹ Number of bearing fruit trees and grapevines given for all years except 1944; the 1944 figures are for trees and vines of all ages.

² Cut and fed unthreshed.

³ Dry.

⁴ Cowpeas.

⁵ Not reported.

with 730 acres and a yield of 882 tons of hay. Other cultivated grasses, second to lespedeza, were grown on 41 acres, and the yield was 42 tons. Timothy and clover mixed, third among the hay crops in rank, was grown on 16 acres and produced a total of 26 tons.

Since 1944 production of oats and wheat has increased rapidly and substantially, but rye acreages continue to decrease. Rye is no longer of any importance, and is used mainly as a winter cover crop. Wheat and oats are now the main small grain crops grown to maturity. There has been a substantial decrease in soybean production since 1944, and a large increase in permanent meadow consisting of Ladino clover or white clover seeded with orchard grass, tall fescue, and redtop. Some acreage has also been seeded to alfalfa. Crimson clover, annual lespedeza, and ryegrass are now important crops. Grain sorghums are also of increasing importance especially where they are used in a rotation and seeded with crimson clover and ryegrass.

Most of the corn, rye, wheat, and hay is used on the farms. Many farmers must supplement what they raise with supplies purchased

elsewhere. Potatoes, sweetpotatoes, snap beans, cabbage, and other vegetables are grown for home use; only small acreages of vegetables are grown for market. Apples and peaches are produced on nearly every farm, but only five commercial orchards are in the county. Other fruits are pears, plums, cherries, and grapes, and there are a few pecan trees. Improved varieties of strawberries are grown for home use on a few farms. There is an abundance of wild blackberries and dewberries, but only a few wild strawberries. The trend in fruit production seems to be toward more grapes and cherries and away from apples, peaches, pears, plums, and prunes.

The principal forest products are hemlock and chestnut tanbark, dogwood spindles, white-oak staves, poplar veneer, locust posts, and various kinds of lumber. Much of the timber is cut under contract from national forest land. Sample workings indicate that about 45 percent of the white oak in the entire Chattahoochee National Forest that needs cutting is suitable for making staves.⁷

CROP ROTATIONS, FERTILIZERS, AND CROP ADAPTATIONS

On many farms—particularly subsistence farms on soils of the Hayesville, Fannin, and Talladega series—no systematic rotation is followed and corn is grown year after year for many years. On farms where livestock or livestock products provide an important part of the farm income, a 2-year rotation of corn and rye is followed. The rye is sometimes plowed under to improve the soil. A 3-year rotation of corn and rye, with lespedeza seeded in the rye, is used by some farmers and is growing in favor. Now corn, fall oats, and red clover is probably the most important rotation on well-drained soils of the terraces and uplands. Heavy applications of fertilizers are depended on to maintain the fertility of most soils in the first bottoms used for truck crops. In some fields snap beans follow small grain. In others beans follow potatoes, and the fertilizer not used by the potatoes is largely depended on to supply nutrients for the beans.

Practices of fertilization vary widely, but fertilizer is used in at least small quantities on most farms. Lime is used on most farms where legumes are planted. In 1939, 484 tons of fertilizer and 760 tons of lime were purchased.

Complete fertilizers, as 4-8-4,⁸ 3-9-3, 4-8-6, 6-8-8, 4-12-12, or superphosphate or treble phosphate, are used on corn, sorghum, and small grain. They are applied at the rate of 100 to 1,000 pounds an acre at seeding and are supplemented in some fields with a dressing of 50 to 200 pounds an acre of nitrate of soda or ammonium nitrate. When legumes for pasture are fertilized and limed, 500 to 1,000 pounds of superphosphate and 1 to 4 tons of lime are applied an acre. Cowpeas receive 100 to 200 pounds of superphosphate; and potatoes and beans, 400 to 1,600 pounds of 4-8-4 or 3-9-3. Cabbage, spinach, collards, and other truck crops receive 400 to 1,200 pounds of one of these; and tobacco, 200 to 300 pounds.

Most of the red and yellow soils of the uplands and terraces of suitable quality are used for general farm crops. The better brown and gray soils of the first bottoms are preferred for truck crops but are

⁷ See footnote 6, p. 8.

⁸ Percentages, respectively, of nitrogen, phosphoric acid, and potash.

used extensively for others. Farms made up mostly of poor cropland are generally of the subsistence type and keep less livestock than farms composed of the better soils.

Corn, the most important crop in acreage and production, is grown on nearly every soil type and phase used for crops, and the yields vary widely. Corn is a hardy crop, easily grown, and free from disease, but it is a heavy feeder. If high yields are to be produced, the soil must be well supplied with plant nutrients and moisture and in good tilth. Corn is sensitive to soil acidity; the pH should not be lower than 6.5. These conditions are best met by the Congaree, Transylvania, and Toxaway soils of the first bottoms and the State, Tate, and Tusquitee soils of the low terraces and colluvial slopes. Some of the loams or clay loams of the Hayesville, Hiwassee, and Fannin series can be built up to produce satisfactory yields of corn, but most soils of the county not already named produce low yields of corn because of poor tilth conditions, lack of moisture, and deficiencies in available plant nutrients, especially the latter condition.

Rye and wheat can be profitably grown for home use, and on sloping land they afford excellent cover during winter. Both crops are best adapted to well-drained soils of terraces and uplands; areas of Hiwassee, Altavista, Hayesville, and Fannin loams or clay loams are preferred for their production.

Sorghum, grown for the production of sirup, attains its heaviest growth on soils high in organic matter, but plants on these soils produce dark and otherwise low-quality sirup. Farmers therefore prefer soils such as the Tate, Chewacla, Tate-Chewacla, and Warne-Worsham, which have ample moisture but are low in organic matter and plant nutrients. Fertilization is mainly with phosphorus. Both manure and nitrate of soda seem to produce undesirable effects on the quality of the sirup.

The leguminous crops adapted to the climate differ in their suitability to the various soils. Red clover, which is sensitive both to excess moisture and to acidity and requires soil with better than the average fertility, is confined largely to the more productive phases of Hayesville, Hiwassee, and Fannin loams and to Hayesville and Fannin clay loams. Lime is commonly applied a few months before red clover is seeded and repeated at 3-year intervals. Crimson clover and white clover—less sensitive than red clover to soil acidity and to water-logging—are grown on soils that in places lack adequate drainage. Nonetheless, lime generally is applied before crimson or white clovers are planted. Crimson clover is used largely for green manure preceding corn, especially on the Altavista soils. White clover mixed with bluegrass, redtop, orchard grass, and lespedeza is grown for permanent pasture, mainly on Altavista, Warne-Worsham, and Spilo soils.

Lespedeza, the most extensively grown legume, has wide soil adaptations. Annual lespedezas are suited to moisture conditions ranging from permanently wet to dry and can be grown on severely eroded slopes that have poor tilth conditions. Sericea lespedeza is suited to very severely eroded slopes where little more than the parent material of the original soil remains. The lespedezas will grow under very acid conditions, but the best results are obtained where the pH is above 5.0.

Truck crops differ in soil requirements but generally need soils well supplied with moisture, organic matter, and plant nutrients. Favorable tilth conditions are important, especially if the organic-matter content is low. For some crops, as potatoes, a loose pervious subsoil is essential. The most desirable soils for truck crops are Transylvania silt loam; Transylvania fine sandy loam; Toxaway silt loam; State silt loam, undulating phase; Tusquitee loam, eroded rolling phase; and Tusquitee loam, undulating phase. Congaree silt loam, Congaree fine sandy loam, and Chewacla silt loam are slightly less desirable because they are inherently less fertile than the Transylvania and Toxaway soils, but with proper management, including heavy applications of fertilizer, their deficiencies can be corrected to a large degree.

LIVESTOCK AND LIVESTOCK PRODUCTS

Livestock and livestock products are important in the agriculture of the county. Dairy cattle are kept on nearly all farms, mainly for a home supply of milk and butter, but whole milk, cream, and butter are sold from a few farms. One milk route is well-established, and there is one commercial dairy.

In 1945, slightly more than 95 percent of the farms in the county reported cattle raised. The total number of cattle and calves was 2,698, and of this total, 1,411 were cows and heifers milked. Grade Jersey cattle predominate, but there are some purebred cattle of Jersey, Hereford, and Shorthorn breeds.

Swine, raised on about two-thirds of the farms in 1945, are mainly of mixed Poland China, Duroc, and Ohio Improved Chester breeds. They are raised chiefly to supply meat for farm use. Sheep were reported on only 13 farms in 1945. The number of sheep has decreased greatly since 1920.

Chickens were reported on 790 farms, or more than 97 percent of all farms in the county, in 1945. Chickens have been kept principally for home use, but are an increasingly important source of income. The production of hatching and market eggs and broilers for the

TABLE 3.—*Number of livestock and beehives on farms in Towns County, Ga., in stated years*

Livestock	1920	1930	1940	1945
	Number	Number	Number	Number
Horses-----	281	¹ 131	¹ 430	274
Mules-----	765	¹ 629	¹ 400	428
Cattle-----	2,939	¹ 1,895	¹ 2,222	2,698
Sheep-----	1,363	² 693	² 393	148
Goats-----	27	29	⁽³⁾	3
Swine-----	6,753	¹ 2,058	⁴ 1,644	2,615
Chickens-----	23,285	¹ 19,869	⁴ 21,821	34,005
Other poultry-----	1,661	⁽³⁾	⁴ 171	⁽³⁾
Beehives-----	1,293	868	422	⁽³⁾

¹ Over 3 months old, Apr. 1.

² Over 6 months old, Apr. 1.

³ Not reported.

⁴ Over 4 months old, Apr. 1.

TABLE 4.—*Specified livestock and livestock products, Towns County, Ga., in stated years*

Item		1919	1929	1939	1944
Cows milked	number	(¹)	1,044	1,146	1,411
Milk produced	gallons	346,535	426,542	418,409	636,225
Milk sold	do	9,038	5,020	11,655	89,780
Cream sold	do	(¹)	50	(¹)	(¹)
Butterfat sold	pounds	150	7,581	9,926	15,989
Butter churned	do	104,352	103,086	107,656	(¹)
Butter sold	do	3,230	5,453	2,383	1,665
Chickens raised	number	47,665	47,743	34,186	(¹)
Chickens sold	do	23,473	26,805	15,722	(¹)
Eggs produced	dozens	78,871	146,641	144,579	269,387
Eggs sold	do	51,468	106,207	(¹)	(¹)
Sheep shorn	number	1,036	614	327	(¹)
Wool produced	pounds	2,200	1,667	1,103	453
Mohair produced	do	(¹)	22	(¹)	(¹)
Honey produced	do	18,733	3,581	2,870	(¹)
Wax produced	do	174	(¹)	(¹)	(¹)

¹ Data not available.

Gainesville and Atlanta, Ga., and the Asheville, N. C., markets is rapidly becoming a well-developed specialized enterprise on many farms. On a few farms, turkeys, guineas, and ducks are raised.

Although tractors supply most of the farm needs for field work, a few horses and mules are used for work stock. The better horses, mainly of grade Morgan stock, weigh 1,000 to 1,200 pounds; the mules, 800 to 1,000 pounds. On many of the smaller farms, especially those operated by tenants, grade Hereford and Jersey oxen weighing 600 to 900 pounds were used as work stock until rather recently. This practice has been discontinued.

The number of livestock and beehives on farms is given in table 3 for stated years; and in table 4, the production and sale of specified livestock products. The number of chickens on farms has greatly increased since 1945. Many farmers now keep 5,000 or more chickens for production of hatching eggs and broilers.

TYPES OF FARMS

Most of the farmers grow products primarily for their own use. In 1945, as classified by type and total value of farm income, 700 farms were of type producing mainly for home use. Of the rest of the farms, 2 specialized in fruit and nuts, 1 in vegetables, and 19 were planted to other crops. The production of dairy products was the primary occupation on 5 farms, poultry on 10 farms, livestock on 8 farms, and forest products on 18. General farms numbered 48.

LAND USE

A total of 40,041 acres, or 36.4 percent of the county, was in farms in 1944. The acreage in farms was divided as follows: Cropland harvested, 9,248 acres; plowable pasture, 679; woodland, 21,702; and all other land, 8,412. The nonfarm land is mainly in the national

TABLE 5.—*Farm land according to use in Towns County, Ga., in stated years*

Land use	1929	1939	1944
Land available for crops (harvested, failure, idle or fallow, and plowable pasture)	Acres 17, 354	Acres 16, 672	Acres 11, 196
Cropland harvested	10, 894	10, 436	9, 248
Crop failure	178	83	86
Cropland, idle or fallow	2, 913	1, 888	1, 183
Plowable pasture	3, 369	4, 265	679
Woodland	26, 977	16, 555	21, 702
All other land	3, 465	4, 389	7, 143
Total farm land	47, 796	37, 616	40, 041

forest or other forested areas. The use of the land in farms is given in table 5 for stated years.

The number and size of farms, the percentage of the county in farms, and the percentage of improved land in farms is given in table 6. As this table indicates, the number of farms has increased, but the average size of the farms has decreased.

In 1945 the 811 farms in the county ranged in size from less than 10 to about 1,000 acres. There were 75 farms under 3 acres; 127 from 3 to 9; 186 from 10 to 29; 147 from 30 to 49; 83 from 50 to 69; 84 from 70 to 99; 60 from 100 to 139; 23 from 140 to 179; 8 from 180 to 219; 5 from 220 to 259; 6 from 260 to 379; 3 from 380 to 499; 3 from 500 to 699; and 1 from 700 to 999.

TABLE 6.—*Number and size of farms and farm areas in Towns County, Ga., in stated years*

Year	Total farms	Area in farms	Average size of farms	Improved land in farms	Improved land per farm
	Number	Percent	Acres	Percent	Acres
1920	696	58.2	96.9	33.7	32.7
1930	656	41.3	72.1	36.3	26.2
1940	741	34.2	50.8	44.3	22.5
1945	811	36.4	49.4	28.0	13.8

FARM TENURE

In 1944 full owners operated 557 farms, or 68.7 percent of the farms of the county; part owners, 66 farms; and all tenants, 187 farms. The kind and number of tenants in 1945 were as follows: Cash tenants

35, share-cash tenants 2, share tenants and croppers 93, and other tenants 57.

Of all the land in farms, 30,239 acres were operated by full owners in 1944; and 3,525 acres by part owners. Tenants operated 5,334 acres, and of this total, 589 acres were operated by cash tenants and 3,029 acres by share-cash tenants and by share tenants and croppers. Full owners harvested 5,978 acres of cropland in 1944; part owners, 1,328 acres; and all tenants, 1,814 acres.

Two systems of share rental are practiced. Under one, the landlord furnishes the land, work animals, and two-thirds of the seed and fertilizer and receives two-thirds of the crops, including roughage. Under the other system, the tenant furnishes the work animals and half the seed and fertilizer and receives half of the crops.

FARM IMPROVEMENTS AND EQUIPMENT

The extent and quality of improvements and the standard of living maintained by the farmer are usually an index to the productivity of the land on his farm. Where land is of the better types, there are generally substantial buildings and other improvements. On farms where the lay of the land, erosion, shallowness of soil to bedrock, or stoniness limit productivity, improvements are likely to be fewer and the standard of living lower.

Many of the farms are fenced with woven wire, but numerous fields and pastures are enclosed by rail or brush fences. More fences of woven wire and barbwire could be used to good advantage. Electricity for light and power was available to more than half of the farms in 1945. In that year, 382 farms had an electric distribution line within a quarter mile of the farm dwelling. Only 2 farms had telephones.

On the average farm the equipment is one- or two-horse breaking plows, walking cultivators, a wagon, a sled, and hoes and other small tools. More expensive equipment—mowers, hay rakes, binders, combines, and such machinery—is owned by a few farmers. In 1945, 160 farms reported 167 automobiles; 50 farms, 52 motortrucks; and 11 farms, 12 tractors. Now (1951) nearly all farmers have one or more tractors.

SOIL SURVEY METHODS AND DEFINITIONS

In making a soil survey the soils are examined, classified, and mapped in the field and their characteristics recorded, particularly in regard to the growth of various crops, grasses, and trees.

The soils and the underlying formations are examined systematically in many locations. Test pits are dug, borings made, and highway or railroad cuts and other excavations studied. Each excavation exposes a series of layers, or horizons, termed collectively the soil profile. Each horizon, as well as the underlying parent material, is studied in detail, and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The reaction of the soil and its contents of lime and salts are

determined by simple tests.⁹ Other features taken into consideration are the drainage, both internal and external, the relief, or lay of the land, and the interrelations of soil and vegetation.

The soils are classified according to their characteristics, both internal and external, with special emphasis on the features that influence the adaptation of the land for the growing of crop plants, grasses, and trees. On the basis of these characteristics, soils are grouped into classification units, the principal three of which are (1) series, (2) type, and (3) phase.

The series is a group of soils having the same kind, thickness, and arrangement of layers, and having similar parent material. Thus, the series comprises soils having essentially the same color, structure, natural drainage, and other important internal characteristics and the same range in relief. The texture of the upper part of the soil, including that commonly plowed, may vary within a series. The series are given geographic names taken from localities near which they were first recognized; Hayesville, Tusquitee, Transylvania, and Congaree are names of important soil series in Towns County.

Within a soil series are one or more soil types, defined according to the texture of the upper part of the soil. Thus, the class name of this texture—sand, loamy sand, sandy loam, silt loam, clay loam, silty clay loam, or clay—is added to the series designation to give a complete name to the soil type. For example, Transylvania silt loam and Transylvania fine sandy loam are soil types within the Transylvania series. Except for the texture of the surface soil, these types have approximately the same internal and external characteristics.

A soil phase is a variation within the type. Each phase differs from the other phases in respect to some characteristic, generally external, that may be of special practical significance. For example, within the normal range of relief of a soil type some areas may be adapted to the use of machinery and the growth of cultivated crops and others may not. Differences in relief, stoniness, and degree of erosion may cause soil types to be divided into phases. Even though no important differences may be apparent throughout the soil profile, there may be important differences in respect to the growth of cultivated crops. In such instances the steeper parts of the soil type may be segregated on the map as a steep phase. Hayesville loam, steep phase, is an example of a phase in the Hayesville series. Similarly, different parts of the same soil type may vary greatly in degree and kind of accelerated erosion, and such differences may be expressed as phases, as for example Porters loam, eroded steep phase.

⁹ The reaction of the soil is its degree of acidity or alkalinity expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality; higher values, alkalinity; and lower values, acidity. Terms referring to reaction commonly used in this report are defined in the Soil Survey Manual (8) as follows:

	<i>pH value</i>		<i>pH value</i>
Extremely acid.....	Below 4.5	Neutral.....	6.6-7.3
Very strongly acid.....	4.5-5.0	Mildly alkaline.....	7.4-8.0
Strongly acid.....	5.1-5.5	Strongly alkaline.....	8.1-9.0
Medium acid.....	5.6-6.0	Very strongly alkaline.....	9.1 and higher
Slightly acid.....	6.1-6.5		

In a practical sense, the degree of acidity may be thought of as the degree of poverty in lime (available calcium). The presence of lime in the soil is detected by the use of a dilute solution of hydrochloric acid.

Where very small areas of two or more kinds of soil are so intricately mixed that they cannot be shown separately on a map of the scale used, they are mapped together, and the areas of the mixture are called a soil complex. Soil complexes in this county are Fannin-Talledega loams, hilly phases, and Tate-Chewacla silt loams.

Areas such as bare rocky mountainsides, coastal beach, or dune sand that have very little true soil are not designated with series and type names but are given descriptive names. Rough stony land (Porters soil material) and Stony colluvium (Porters and Hayesville soil materials) are miscellaneous land types in this county.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, complexes, and miscellaneous land types in relation to roads, houses, streams, lakes, and other cultural and natural features of the landscape.

Some of the terms mentioned in the report are in common use and need no explanation. Others have special meaning in soil science. For example, texture refers to the relative proportions of clay, silt, and various grades of sand that make up the soil mass. Coarse-textured soils contain much of the coarser separates (sands), and fine-textured soils contain much clay. Structure refers to the natural arrangement of the soil material into aggregates, or structural particles or masses. Consistence refers to such soil characteristics as friability, plasticity, stickiness, hardness, compactness, toughness, and cementation. Permeability and perviousness connote the ease with which water, air, and roots penetrate the soil. Surface soil ordinarily refers to the coarser textured surface layer, which is usually 6 to 12 inches thick. The subsoil is the finer textured and thicker layer immediately below the surface soil and usually is of uniform color in well-drained soils. The substratum, or soil material layer, is beneath the subsoil. Bedrock, as used here, is consolidated rock that underlies the stratum.

Workability refers to the ease with which tillage, harvesting, and other farming operations can be accomplished. Six descriptive terms used in this report, in decreasing order of ease of performance of farming operations, are: Excellent, very good, good, fair, poor, and very poor. A soil with excellent workability is one on which all the common kinds of farm machinery can be used with a minimum of effort. One with very good workability is suited to the use of all common types of farm machinery, but some feature, as fine texture, small quantities of rock fragments, or somewhat uneven but mild slopes, makes their use more difficult than on a soil of excellent workability. A soil with good workability is suited to the use of all common kinds of farm machinery, but their use requires more effort than on soils of very good workability. Soils of fair workability are poorly suited to the use of heavy farm machinery, and may make the use of most farm implements more difficult than on soils of good workability. Soils of poor workability are not suited to the use of heavy farm machinery and all types are used with great difficulty. Soils of very poor workability can generally be tilled only with hand implements.

Conservability, as used in this report, refers to the ease with which productivity and workability can be maintained or improved. Major factors considered are ease of conserving soil material and plant nutrients and ease of maintaining good tilth. The six descriptive

terms, in decreasing order of ease of conservability, are the same as for workability. In general, excellent, very good, good, and fair are relative terms within the range of conservability. Poor and very poor indicate that conservability is too difficult on the majority of farms for the feasible use of the soil for tilled crops.

Productivity refers to the capacity of a soil to produce crops under the prevailing farming practices. A soil may be productive of a given crop but may not be well suited to it because of poor workability or conservability, or both. The following relative terms are used in this report to describe productivity: Very good, good, fair, poor, and very poor.

Slope is one of the main external characteristics that affects the use and management of soil. Accordingly, several types of surface relief are generally recognized in the soils of an area, and each type has a certain slope range. The types of relief and slope range are as follows:

	Percent slope		Percent slope
Level or nearly level-----	0-2	Hilly-----	¹ 15-30
Undulating or gently sloping-----	2-7	Steep-----	30-60
Rolling-----	7-15	Very steep-----	60+

¹ Exceptions in Towns County are in the slopes of Porters-Balfour loams, hilly phases, and Porters-Balfour loams, eroded hilly phases, where the range is 15 to 40 percent.

On level or nearly level soil and under normal conditions of tillage, accelerated erosion is at a minimum. The slope does not hinder tillage operations. Water flows slowly and carries away little soil material.

On undulating or general sloping soils water can be controlled by proper crop rotations, contour tillage, or terraces. External drainage is moderately slow, but the water flows in rills and has a low but definite transporting capacity. The slopes only slightly hinder the use of heavy farm machinery, and clean-cultivated crops can be grown.

Rolling soils are suitable for close-growing crops and may be suitable for clean-cultivated crops in long rotations, providing contour tillage, terracing, or in places, strip cropping is practiced. The relatively strong slopes make the use of heavy machinery cumbersome but permit the use of light machinery and farming implements. Runoff is moderately rapid, and water flows in well-defined rills and other small drainageways, and has considerable transporting power.

Hilly soils are suitable for pasture or forest, insofar as slopes are concerned, but are not suitable for clean-cultivated crops. Slopes hinder the use of heavy farm machinery but not that of light machinery or implements. Water flows rapidly through well-defined channels and has a high carrying capacity. Where the natural cover has been removed and the soil is erosive, rapid deterioration of the soil through sheet and gully erosion, or both, is to be expected.

Steep soils are best suited to forest. Use of farm machinery is not feasible because slopes are too steep. Except on soils very resistant to erosion, runoff removes soil material rapidly where slopes are cleared of the natural vegetative cover.

Very steep soils can be used most feasible for forest, although they may have low value for such use. The slopes are so steep that

horses and, in places, even oxen cannot well be used for removing bulky forest products.

Erosion is an external condition that affects a comparatively large total area of some of the soils of the county. Much of the moderately eroded and severely eroded soil is mapped as separate phases. The moderately eroded soil is designated and described as an eroded phase, and is generally confined to cultivated land, pasture land, idle land, and land returned to forest. The moderate and the severe erosion have been caused largely by the action of man.

Moderately eroded soil includes areas eroded to the extent that the subsoil is within plow depth over half or somewhat more of the mapped area. Ordinary tillage mixes part of the upper subsoil with the remaining surface soil and the color and texture of the surface layer is somewhat altered. In most places the soil has been definitely impaired by sheet erosion, but in some eroded areas short shallow gullies, usually somewhat more than 100 feet apart, have caused some of the erosion. Although a few of the gullies may be too deep to be filled by ordinary plowing, none is too deep for farm implements to pass over readily. From 50 to 75 percent of the original surface layer (A horizon) has been lost through accelerated erosion from areas mapped as moderately eroded.

Severely eroded areas have lost 75 percent or more of the original surface layer and in places part of the subsoil through accelerated erosion. Tillage of these areas is almost entirely in the subsoil. Erosion has seriously affected the soil in most places, and short gullies may occur at intervals up to 50 feet. The gullies are shallow, and farm machinery may be drawn across them; but some of them are too deep to be filled by ordinary plowing.

In addition to the eroded soil areas delineated on the soil map, many eroded areas of $2\frac{1}{2}$ acres or less are not delineated but are indicated by symbols that show the degree of erosion. Gullies 300 feet or more long are also shown by symbols. The meaning of the various erosion symbols is explained in the legend on the margin of the soil map.

Stoniness is a condition generally indicated in the name of the soil type, but areas of less than $2\frac{1}{2}$ acres sufficiently stony to interfere materially with or preclude cultivation are shown by symbols explained on the margin of the soil map.

SOILS

Soil is made through the influence of both physical and biological forces. Rocks through weathering provide crude materials from which soils have formed, and rain, sun, and plants have changed them greatly. Soil constitutes a natural medium for the growth of land plants on the surface of the earth and is composed of both organic and mineral materials (13).

In many of the soils of the county the profile consists of three layers that differ somewhat in thickness, color, texture, and consistence. The first is the surface soil, which is 6 to 10 inches thick in soils very little affected by erosion. In some soils, however, this surface layer may be as much as 18 inches thick. The second layer, or the subsoil, is 15 to 30 inches or more thick. The third layer, or substratum, ranges from a few inches to several feet in depth. Very little textural

difference exists between surface soil and subsoil of some soils on the first bottoms near streams and on the mountains.

The surface soils and subsoils are usually red, yellow, brown, gray, or shades of these, although in some soils of the terraces and the first bottoms the subsoils are mottled or streaked gray and yellow or gray and brown.

Most of the surface soils consist of loam, stony loam, clay loam, stony clay loam, and silt loam. In a small total area they are fine sandy loam and silty clay loam. The surface soil of many soils is friable in consistence, but some is loose, mellow, crumbly, fluffy, compact, or plastic.

The texture of the subsoil is generally clay loam but in some soils it is silt loam, silty clay loam, or clay. The subsoil has a friable consistence in some soils; in others it is loose or crumbly; and in still others it is compact, stiff, plastic, or tough.

The substratum is composed of soft decomposed rock material and in many places is more friable than the subsoil. In some areas no substratum is present and the subsoil lies on bedrock. Where subsoil is not present, the surface soil grades into soft decomposed rock or rests on the bedrock.

In forested areas a layer of decayed leaves, twigs, and other vegetable material covers the soil and has stained it brown or dark brown to a depth of 1 to 3 inches.

All the soils are acid, but their degree of acidity varies. With the exception of soils of the Toxaway, Transylvania, Tusquitee, and State series, they have a low organic-matter content. Available supplies of phosphate, potash, and calcium are deficient, or even lacking, particularly in the red and yellow soils of the terraces and uplands. Tilth is generally good in soils with a silt loam, loam, or fine sandy loam texture but poor in soils of clay loam or silty clay loam texture. Internal drainage is medium in all the soils except some of those on the terraces and bottom land. Internal drainage of soils in those positions may be slow or very slow.

Relief, stoniness, and accelerated erosion affect the use and management of a large part of the soils in the county. As estimated from the soil map, nearly 70 percent of the land is steep to very steep; 16 percent, hilly; and the rest, level to rolling or sloping. About 57 percent is stony, ranging from stony clay loam to rough stony land. About 15 percent of the land has been moderately eroded since being cleared; accelerated erosion has removed the original surface soil to the extent that the plow layer contains variable quantities of subsoil material. About 5 percent of the county has been severely eroded; all or practically all the original surface soil has been lost and the plow layer consists entirely, or almost entirely, of subsoil material.

SOIL SERIES AND THEIR RELATIONS

The soil series of the county are grouped according to the major land features as soil series of the (1) uplands, (2) colluvial slopes, (3) stream terraces, and (4) stream bottoms. Uplands are underlain by material weathered from the underlying rock and have a surface soil that has not been transported to its present position by water. Colluvial slopes are foot slopes in the uplands, and soils on these slopes

are derived from accumulations of materials washed or sloughed from the higher slopes. Stream terraces are water-made benches bordering stream bottoms, but they occupy higher positions than the bottoms and are not subject to flooding. Stream bottoms are the first bottoms near streams. The soils in the bottoms consist of water-borne materials and they are commonly subject to overflow during floods. The topographic position and main characteristics of each soil series are given in table 7.

SOILS OF UPLANDS

All soils of the uplands have developed from parent material consisting of soft decomposed igneous and metamorphic rock. They have slow to very rapid external drainage, and all except the Worsham have medium internal drainage. Internal drainage in the Worsham soil is relatively slow. The soils differ greatly in profile characteristics, productivity, and use suitability.

Soils of the Porters, Balfour, Rabun, and Talladega series are on mountain uplands; those of the Fannin, Hayesville, and Worsham series are on intermountain uplands. Although climate and vegetation have been important factors in the formation of the various soils, parent material and surface relief have also been important, and differentiation among the soils is to some extent due to the influence of these factors.

The soils on the mountains are prevailingly steep and very steep, but areas of some are rolling or hilly. In most places their profiles are poorly or indistinctly developed. In general, the Porters and Balfour soils came from weathered material of granite-gneiss and schist rock, the Rabun from weathered material of hornblende gneiss mixed with other kinds of rock, and the Talladega from weathered material of micaceous schist rock.

On the intermountain uplands the relief is much milder than on the mountain uplands, but it is steep in places. Here the relief generally has been much more favorable to the formation of deep soils than on the mountains, and better developed profiles generally have been formed. The soils of the Fannin series were derived from weathered material of micaceous schist rock, and those of Hayesville and Worsham series, from weathered material of granite-gneiss rock.

SOILS OF COLLUVIAL LANDS

Colluvial material accumulated at the foot of slopes has given rise to soils of the Tusquitee and Tate series. The Tusquitee soils are generally at the foot of mountain slopes, whereas the Tate are generally at the base of slopes in intermountain uplands. The colluvial material includes rock fragments and other rock waste and also soil material washed and slumped from higher lying soils. In some places local alluvial material is mixed with the colluvial material.

The Tusquitee and Tate soils are predominantly brown, although the Tate soils are red or reddish or yellowish red in some places. Soils of both series are friable and mellow and apparently contain a moderate quantity of organic matter. Drainage is medium, but in some places internal drainage is slow in the lower part of the profile. Differences in these soils are largely the result of differences in character of parent material.

SOILS OF TERRACES

The Hiwassee, Altavista, Warne, and State are soils on stream terraces. Their parent material is alluvial and is derived from uplands underlain by igneous and metamorphic rocks. The chief characteristics differentiating these soils are color and drainage. The Hiwassee have a dark reddish-brown surface soil, dark-red subsoil, slow to rapid external drainage, and medium internal drainage. The Altavista have a light-gray to grayish-yellow surface soil and grayish-yellow to yellow subsoil. Their external drainage is slow to rapid, and internal drainage slow. The Warne soils have a light-gray surface soil and a light-gray, streaked with yellow, subsoil. They have slow to rapid external drainage and slow to very slow internal drainage. The State soils have a very dark grayish-brown surface soil and a brown subsoil. Their external drainage is very slow to medium, and internal drainage is medium.

SOILS OF BOTTOM LANDS

Soils of bottom lands are on first bottoms and lie only a few feet above the level of the streams. They are soils of the Congaree, Transylvania, Chewacla, Spilo, and Toxaway series. Drainage ranges from medium in the Congaree soils to slow in the Toxaway. All the soils of this group are flooded by the streams during unusually heavy rains. They consist of sand, silt, and clay alluvium derived from uplands underlain by igneous and metamorphic rocks. Their differences are largely in parent material and in condition of drainage.

SOIL SERIES, TYPES, AND PHASES

In the following pages the soil series, types, and phases are described in detail and their agricultural relations are discussed. The accompanying map shows their location and distribution, and table 8 gives the acreage and proportionate extent of each soil.

ALLUVIAL SOILS, UNDIFFERENTIATED

Alluvial soils, undifferentiated (A), occur in narrow first bottoms of streams in the mountains, principally near the Tallulah River and small tributaries of the Hiwassee River. The separation consists of brown sand, sandy loam, or silt loam soils near streams and black mucky materials where drainage is poor. The soils are so variable both in color and in texture that differences could not be accurately indicated on the soil map. Also, the color and texture are not permanent because they are much changed by overflow from adjacent streams during each period of high water.

Old stream channels dissect the land so intricately that cultivation is not practicable, even with the light implements ordinarily used in mountainous districts. Crop losses resulting from stream overflow are to be expected in most places.

Use and management.—Alluvial soils, undifferentiated, is not easily accessible for farming, and at least 95 percent of the area has never been cleared for agricultural use. The land is well suited to bluegrass and white clover. Cleared areas and areas with a few trees would produce good pasture if proper management practices were followed.

TABLE 8.—*Acreage and proportionate extent of the soils of Towns County, Ga.*

Soil	Acres	Percent
Alluvial soils, undifferentiated-----	727	0.7
Altavista clay loam:		
Eroded rolling phase-----	364	.4
Eroded undulating phase-----	169	.2
Altavista loam:		
Undulating low terrace phase-----	253	.2
Undulating phase-----	192	.2
Balfour loam, rolling phase-----	59	.1
Balfour stony loam, eroded rolling phase-----	96	.1
Chewacla silt loam-----	465	.4
Congaree fine sandy loam-----	240	.2
Congaree silt loam-----	328	.3
Fannin clay loam:		
Eroded hilly phase-----	827	.8
Eroded rolling phase-----	833	.8
Severely eroded hilly phase-----	391	.4
Fannin loam, rolling phase-----	228	.2
Fannin-Talladega loams, hilly phases-----	722	.7
Hayesville clay loam:		
Eroded hilly phase-----	3,089	3.0
Eroded rolling phase-----	2,546	2.0
Eroded steep phase-----	499	.5
Severely eroded hilly phase-----	2,787	3.0
Severely eroded rolling phase-----	110	.1
Severely eroded steep phase-----	833	.8
Hayesville loam:		
Eroded undulating phase-----	88	.1
Hilly phase-----	2,634	3.0
Rolling phase-----	796	.8
Steep phase-----	1,589	2.0
Hayesville stony clay loam:		
Eroded hilly phase-----	478	.5
Eroded rolling phase-----	161	.2
Severely eroded hilly phase-----	324	.3
Hayesville stony loam:		
Hilly phase-----	614	.6
Rolling phase-----	130	.1
Steep phase-----	1,027	1.0
Hiwassee-Hayesville stony loams, eroded hilly phases-----	563	.5
Hiwassee loam:		
Eroded rolling phase-----	1,206	1.0
Eroded undulating phase-----	148	.1
Undulating phase-----	109	.1
Porters-Balfour clay loams, eroded hilly phases-----	276	.3
Porters-Balfour loams, hilly phases-----	249	.2
Porters-Balfour stony clay loams, eroded hilly phases-----	815	.8
Porters-Balfour stony loams, hilly phases-----	1,914	2.0
Porters loam:		
Eroded steep phase-----	301	.3
Steep phase-----	1,225	1.0
Porters stony loam:		
Eroded steep phase-----	1,158	1.0
Steep phase-----	29,668	28.7
Very steep phase-----	23,438	22.7

TABLE 8.—*Acreage and proportionate extent of the soils of Towns County, Ga.—Continued*

Soil	Acres	Percent
Rabun stony clay loam:		
Eroded rolling phase	8	(1)
Eroded steep phase	236	0.2
Steep phase	109	.1
Rough gullied land (Hayesville soil material)	70	.1
Rough stony land (Porters soil material)	10,827	10.4
Spilo-Chewacla silt loams	230	.2
Spilo silty clay loam	175	.2
Better drained phase	349	.3
State silt loam, undulating phase	243	.2
Stony colluvium (Porters and Hayesville soil materials)	316	.3
Talladega clay loam, severely eroded steep phase	219	.2
Talladega loam, steep phase	1,186	1.0
Tate-Chewacla silt loams	1,197	1.0
Tate silt loam:		
Eroded rolling phase	173	.2
Undulating phase	343	.3
Toxaway silt loam	160	.2
Transylvania fine sandy loam	408	.4
Transylvania silt loam	1,469	1.0
Tusquitee loam:		
Eroded rolling phase	268	.3
Undulating phase	284	.3
Tusquitee stony loam, undulating phase	435	.4
Warne-Worsham loams:		
Eroded rolling phases	187	.2
Undulating phases	119	.1
Total	103,680	100.0

¹ Less than 0.1 percent.

ALTAVISTA SERIES

The soils of the Altavista series have a light-gray, medium-gray, or grayish-yellow friable surface soil and a grayish-yellow or yellow moderately compact stiff heavy clay loam or clay subsoil. Underlying the subsoil is light-gray or mottled light-gray and yellow soil material resting on rounded quartzite gravel at a depth of 4 to 8 feet. Although the soils of the Altavista and Hiwassee series are both developed on terraces and underlain by rounded quartzite gravel, they have strongly contrasting characteristics. The Altavista soils occupy positions on lower terraces and their gray leached surface soil, yellow subsoil, and mottled substratum contrast with the reddish brown, dark red, and red of the corresponding layers of the Hiwassee. The compact stiff consistence of the Altavista subsoil differs from the loose crumbly consistence of the Hiwassee subsoil, although both subsoils may be similar in texture. The Altavista soils are inherently less fertile than the Hiwassee and have lower productivity.

The soils of this series are the undulating and the undulating low terrace phases of Altavista loam and the eroded undulating and eroded rolling phases of Altavista clay loam.

Altavista loam, undulating phase (ALU).—This gray or grayish-yellow soil has a yellow stiff fine-textured subsoil. It occurs on stream terraces in close association with the State soil, also on stream terraces, and with Congaree and other soils of the first bottoms. It is very gently sloping to gently sloping; gradients range from 2 to 7 percent and average 6 percent. Both external and internal drainage are slow. Nearly all the soil is on terraces that lie above overflow, and a large part of it has been cleared for agricultural use.

This loam soil has formed from alluvial material consisting of sand, silt, and clay derived from uplands underlain by granite-gneiss and schist rocks. Areas border the first bottoms of all the larger streams in the Hiwassee Plateau, and some of the most typical are one-half mile north of Young Harris and near Bell Creek northeast of Hiwassee.

Profile characteristics in a cultivated field:

- 0 to 8 inches, medium-gray to slightly grayish-yellow loose gritty loam, which is light gray when dry; low organic-matter content, except in forested areas, where the upper 1- to 2-inch part of the layer has a moderately high organic content and is strongly leached. A large quantity of white coarse sand appears on the surface after rains.
- 8 to 13 inches, grayish-yellow gritty clay loam; stiff and moderately plastic when moist and moderately compact when dry.
- 13 to 32 inches, yellow stiff heavy clay loam; material can be pressed into short ribbons when moist but is compact and hard when dry; penetration of roots and movement of water and air is restricted somewhat by the denseness of this layer; lower part of layer paler, less clayey, and a little more friable than the upper part.
- 32 to 50 inches, mottled light-gray and yellow stiff compact sandy clay; material slightly micaceous and contains less clay than the lower part of the overlying layer.
- 50 to 72 inches, light-gray or grayish-yellow crumbly sandy clay or coarse sandy clay underlain by white rounded quartzite gravel and larger water-worn quartzite fragments.

Throughout the extent of this soil the layers of the profile vary somewhat in thickness. The profile ranges from medium to strongly acid.

This soil is very easily worked and conserved and fairly productive. It warms slowly in spring, remains wetter than many of the soils of the uplands, has a fairly narrow range of moisture conditions for cultivation, and is more highly leached and is very responsive to fertilizer treatments. Open ditches or ditches filled with pine poles and gravel are used in many of the larger areas to improve the slow internal drainage.

Use and management.—Altavista loam, undulating phase, is fair to good for crops and good for pasture. About 65 percent is cultivated, 5 percent is idle land, 15 percent is in permanent pasture, 10 percent is in oak or oak and pine forest, and 5 percent is in shortleaf pine. The principal crops are corn, rye, and lespedeza; less important crops are cowpeas, crimson clover, tobacco, and truck crops, mainly snap beans.

On many farms corn, rye, and lespedeza are grown in rotation; the rye is cut for grain, and the lespedeza is turned under or pastured. In this rotation corn is fertilized with 100 to 200 pounds an acre of either a complete fertilizer, as 2-10-2 or 4-8-4, or superphosphate. Under this treatment corn yields 15 to 30 bushels an acre and averages 25.

Rye, when fertilized, receives 100 pounds an acre of superphosphate and produces 10 to 15 bushels an acre. On unfertilized land rye yields

5 to 7 bushels an acre. Lespedeza generally is not fertilized, but many fields where it is grown are treated with 1 to 1½ tons of ground limestone every 5 or 6 years. Lespedeza harvested for hay produces 1 to 1½ tons an acre. Where two or more leguminous crops have been turned under and the land has been heavily fertilized, yields of corn as high as 50 bushels an acre have been reported. Most of the barnyard manure available is applied to cornland.

Altavista loam, undulating low terrace phase (ALK).—This phase occurs lower on terraces than Altavista loam, undulating phase, and most of its areas are only slightly higher than soils on the adjoining first bottoms. It is associated with soils of the Chewacla and Spilo series in first bottoms in various parts of the Hiwassee Plateau and generally occurs in areas of less than 5 acres. Both external and internal drainage are slow, but in most cultivated areas either open ditches or drains filled with pine poles and gravel and covered with soil are used to improve drainage. Erosion affects the soil very little. Relief is very gently undulating; slopes range up to 5 percent and average 3 percent. The soil is at times subject to overflow by high water from adjacent streams. It is medium to strongly acid.

This phase differs from the undulating phase in several respects. The surface soil averages 10 instead of 8 inches in thickness; has a higher organic-matter content; contains more silt; and is more porous and more permeable to plant roots. It is medium gray when wet and lighter when dry.

The subsoil is lighter clay loam throughout and is less oxidized and less compact than that of Altavista loam, undulating phase. The upper part of the subsoil is light grayish-yellow or pale-yellow slightly compact but plastic clay loam, and at an average depth of 18 inches it grades into yellow dense heavier clay loam. Below a depth of about 24 inches, the subsoil is mottled yellow and light-gray stiff plastic clay loam. This is a lighter clay loam than that of the layer above and it grades at an average depth of 32 inches into light-gray, streaked with yellow, stiff compact slightly micaceous sandy clay. At a depth of 48 to 84 inches this last-named material rests on stratified deposits of white rounded quartzite gravel and somewhat larger water-worn rock fragments. The subsoil is slightly more permeable to air, moisture, and plant roots than the subsoil of the undulating phase.

Use and management.—An estimated 85 percent of Altavista loam, undulating low terrace phase, is under cultivation; 10 percent is in permanent pasture; and the rest is in woodland and miscellaneous uses.

Corn, rye, and lespedeza grown in rotation are the main crops. Corn is fertilized with an average of 150 pounds an acre of 2-10-2 or 4-8-4 and it yields 20 to 30 bushels an acre. On unfertilized land, yields of corn range from 10 to 15 bushels an acre. When rye is fertilized, it receives 100 to 125 pounds of superphosphate an acre and yields 10 to 15 bushels an acre. On unfertilized land the average yield of rye is 8 bushels an acre. Lespedeza yields range from 1½ to 2 tons of hay an acre. Cowpeas or crimson clover are substituted for lespedeza in some fields. They are usually seeded at the last cultivation of corn and then turned under for soil improvement. Cowpeas grown for hay produce 1½ to 2 tons of hay an acre. Soy-

beans are grown on a few areas for hay, and in most places are grown on land treated with 1 to 1½ tons of ground limestone an acre. Soybean hay yields 2 to 2½ tons an acre.

Altavista clay loam, eroded undulating phase (Act).—This phase consists of areas that were formerly Altavista loam but are now eroded to such extent that about one-half to three-fourths of the original surface soil has been removed. The remaining layer of surface soil averages less than 6 inches in thickness. The plowed layer is gray to grayish-yellow clay loam or heavy loam containing considerable subsoil material. In many places, especially in cultivated fields, small patches of yellow subsoil material are exposed, and the soil is much finer textured than elsewhere. Stones are numerous in a few small areas and are indicated on the soil map by symbol.

This eroded undulating phase is on very gentle to gentle slopes. The range is 2 to 7 percent but prevailingly the slopes are about 6 percent. The soil is associated on the terraces with Altavista loam, undulating phase, and other Altavista soils. External drainage is medium to rapid and internal drainage is slow. Tillage operations are fairly easy, although tilth generally is not so good as on the Altavista loam soils. Erosion is moderately easy to control.

Use and management.—Nearly all of the eroded undulating phase of Altavista clay loam is used for crops; principally corn, rye, and lespe-deza, which under common management yield 15 bushels, 10 bushels, and 1 ton an acre, respectively. Much higher yields can be obtained if crops are rotated, liberal quantities of fertilizer are applied, and green-manure crops are turned under to improve tilth. The soil is rated as fair for crops and fair for pasture.

Altavista clay loam, eroded rolling phase (ACG).—Most areas of this soil have a heavier plow layer and stronger slopes (7 to 15 percent) than Altavista loam, undulating phase; otherwise, the two soils are similar. This one has been under cultivation a longer time or has not been so well managed as the undulating phase and has been materially damaged by accelerated erosion. The relatively strong slopes make it easily susceptible to further erosion, and control of erosion is therefore an important problem in its management. In the plow layer sufficient subsoil material is mixed with the surface soil to increase somewhat the clay content, and the prevailing texture is therefore a clay loam. The fine-textured yellow clay loam subsoil is exposed over 5 to 10 percent of some areas. Most areas are less than 10 acres in size and not subject to stream overflow. Slopes are moderate to strong, and external drainage is rapid.

This soil is associated with the two phases of Altavista loam on stream terraces, but it is less well suited to crops and pasture than the undulating phase of Altavista loam. It is fairly easy to work, but good tilth is more difficult to maintain than in the undulating phase. The soil is difficult to conserve, fair in productivity, low in organic-matter content, and medium to strongly acid.

About 85 acres of other Altavista soils, consisting of small areas in which the surface soil is loam, slightly eroded loam, stony loam, eroded stony loam, and stony clay loam, is included with this soil in mapping.

Use and management.—Approximately 15 percent of Altavista clay loam, eroded rolling phase, is forested with oaks and other deciduous

trees. The forested areas consist of uneroded or only slightly eroded soil of loam or stony loam texture. All percentages being approximate, 35 percent of the land is used for cultivated crops; 20 percent is in permanent pasture; 15 percent is lying idle or is supporting natural pasture; and 15 percent is covered with shortleaf pine.

Management is similar to that for Altavista loam, undulating phase, and under common practices the principal crops—corn, rye, and lespedeza—average 13 bushels, 9 bushels, and 1 ton an acre, respectively. About 5 acres of unimproved pasture or 2½ acres of improved pasture are required to supply grazing for a cow.

BALFOUR SERIES

The soils of the Balfour series have profiles generally better developed and deeper to bedrock but otherwise somewhat similar to those of the Porters series. Balfour soils are on top of mountain ridges and on lower slopes of mountains. The relief is prevailingly rolling and gentle in comparison with that of the Porters soils.

The Balfour soils are less brown than Porters soils. The 7- to 10-inch surface soil is brown when moist and grayish yellow to light brown when dry. The subsoil, 20 to 28 inches thick, is brownish yellow, yellowish brown, or light reddish brown, friable, and permeable and is underlain by reddish-colored weathered granite-gneiss. Bedrock usually is reached at a depth of about 8 feet. The units of this series mapped are Balfour loam, rolling phase; and Balfour stony loam, eroded rolling phase.

Balfour loam, rolling phase (BLN).—This brown friable soil has formed on relatively mild slopes of mountains and ridge tops from weathered material of granite-gneiss origin. It resembles Porters loam, which lies at relatively high elevations on mountains, but differs from it in having a somewhat better developed profile and in being deeper to bedrock. Relief is gently rolling to rolling; slopes range from 7 to 15 percent. External drainage is slow to medium; internal drainage is medium. About 40 percent of the total acreage consists of soil that has been moderately or severely eroded, and the eroded areas are indicated on the soil map by symbol. A large part of this loam, which usually occurs in areas of less than 10 acres, has never been cleared for agricultural use.

Profile characteristics in a cultivated field:

- 0 to 8 inches, brown medium to strongly acid fluffy gritty loam; in forested areas to a depth of 1 or 2 inches material is dark grayish brown, the darker color caused by a fairly large accumulation of organic matter.
- 8 to 32 inches, brown or yellowish-brown loose medium to strongly acid crumbly clay loam; material low in organic-matter content and easily permeable to plant roots; bordering Hayesville soil and in places on top of ridges, this layer is reddish brown.
- 32 to 48 inches, yellowish-brown loose crumbly clay loam containing many small angular and subangular quartz particles.
- 48 inches +, reddish weathered granite-gneiss underlain at a depth of 96 inches or more by granite-gneiss bedrock.

The layers of the profile vary slightly in thickness, color, and consistence.

This soil is easy to work and conserve. It contains a fairly low to moderate supply of organic matter and a moderate supply of essential

plant nutrients. It can be cultivated over a fairly wide range of moisture conditions, and when properly managed can be protected fairly well against erosion. Its water-holding capacity and moisture relations for plant growth are good.

Use and management.—Approximately 60 percent of Balfour loam, rolling phase, is in oak-chestnut forest and 10 percent in shortleaf pine. About 15 percent is cultivated; 10 percent is idle; and 5 percent is in pasture consisting largely of bluegrass and white clover. Corn is the principal crop but rye, wheat, red clover, and lespedeza are planted on a small acreage. A few areas are too remote from established farms to be used in any way other than for forest. This soil is fair to good for crops and good for pasture.

The main rotation is composed of corn, a small grain, and lespedeza. The fertilizer treatment generally is 100 to 200 pounds an acre of 4-8-4 for corn, and 100 to 200 pounds an acre of superphosphate for small grain. Under this management corn yields an average of 25 bushels an acre; wheat and rye, 14 bushels each; and lespedeza, 1½ tons of hay. In this rotation some areas are treated with 1 to 1½ tons of ground limestone an acre, and red clover, which yields 1½ tons an acre, is substituted for lespedeza.

Erosion generally can be controlled by proper crop rotations, including winter cover crops, and by fertilizer treatments that maintain a high level of productivity.

Balfour stony loam, eroded rolling phase (Bsg).—This phase is made up of areas of Balfour stony loam in which cultivation has caused the loss of considerable part of the original surface soil. It has many rock fragments on the surface and throughout the soil mass, and the surface and subsoil are more variable than in Balfour loam, rolling phase. Depth to granite-gneiss bedrock ranges from 20 to 36 inches, and is much less than in the last-named soil.

This phase is gently rolling to rolling; slopes range from 7 to 15 percent. It has medium to rapid external drainage and medium internal drainage. The areas, mostly less than 10 acres in size, are on narrow ridge tops and lower mountain slopes near streams.

This is a soil of poor physical suitability for crops requiring tillage but it is fair to good for pasture. A large part, however, is too remote from farmsteads for use as pasture.

Use and management.—About 40 percent of Balfour stony land, eroded rolling phase, is forested, mainly with oak on the ridge tops, and with oak, yellow-poplar, red maple, and ash on the lower slopes near streams. Nearly all the rest of the soil was once cultivated but is now either idle or grown up in shortleaf pine.

CHEWACLA SERIES

Soil of the Chewacla series borders small shallow entrenched drainageways in the Hiwassee Plateau. The alluvial materials giving rise to this soil were washed mainly from Fannin, Talladega, and associated soils that were derived from micaceous schist rock. These alluvial materials have been weathered and are leached and low in organic matter.

The uppermost layer is grayish-brown or brown loose fluffy fine-textured material about 8 inches thick, and underlying to a depth of

about 18 inches is brown loose silt loam. Below this last-mentioned layer is brown, mottled with various shades of gray, loose very micaceous soil material.

Compared with the Congaree soils, which are derived from materials washed from soils underlain by granite-gneiss rock, the Chewacla soil is more highly micaceous and has a high content of finely divided light-colored mica flakes, in places as much as 50 percent. Owing to differences in mineralogic composition, a lower supply of essential plant nutrients and organic matter, less favorable structure, and a waterlogged subsoil in wet seasons, Chewacla soil is inherently less fertile than the Congaree. The Chewacla series is represented in this county by only one type—Chewacla silt loam.

Chewacla silt loam (Ch).—This brown friable soil in first bottoms near streams is characterized by its high content of finely divided mica flakes. The flakes have come from the micaceous schist that gave rise to the alluvial material from which this soil has formed. The relief is level or nearly level, and both external and internal drainage are slow to very slow.

The soil occurs mainly along Winchester, Corn, and Brasstown Creeks and tributaries of these streams near Young Harris and along streams in the northwestern part of the county. It is associated chiefly with Fannin and Talledega soils of the adjacent uplands, and the alluvial material from which it formed came mainly from those soils.

Profile characteristics in a forested area:

- 0 to 2 inches, gray loose fluffy silt loam containing a fairly large quantity of organic matter derived from decayed vegetation; organic-matter content highest in this layer.
- 2 to 18 inches, brown loose fluffy very micaceous silt loam containing a fair quantity of organic matter.
- 18 to 30 inches, brown, mottled with various shades of gray, loose highly micaceous silt loam; under natural conditions layer is saturated with water during wet seasons.
- 30 to 78 inches, mottled poorly oxidized very micaceous waterlogged silt loam or sandy loam.
- 78 inches +, quartz gravel.

In cultivated fields the surface layer to an average depth of 8 inches is grayish-brown loose fluffy silt loam containing a large quantity of small mica flakes. The layers of the profile vary somewhat from place to place in thickness, color, and other characteristics. Many small areas of Chewacla fine sandy loam and Tate silt loam, undulating phase, too small to delineate separately are included with this soil in mapping.

The workability is good and the conservability excellent, but the inherent fertility of this soil is not so high as that of Congaree silt loam. The profile is medium acid to strongly acid. Although it is friable and loose throughout, its lower layers are less easily penetrated by roots than the lower part of Congaree silt loam. Moisture relations generally are favorable to plant growth.

Use and management.—With proper management, including heavy applications of fertilizer, Chewacla silt loam is capable of producing good crop yields. It is rated as fair to good for crops and good for pasture. About 10 percent is in forest of mixed deciduous trees; 45

percent is used for corn, 10 percent for small grains harvested for grain, 10 percent for lespedeza, 10 percent for snap beans, 5 percent for potatoes, 1 percent for cabbage, and 9 percent for permanent pasture and miscellaneous crops.

Corn ordinarily is fertilized with 150 to 200 pounds an acre of 4-8-4, 2-10-2, or superphosphate, but a few fields receive an additional top dressing of 50 to 150 pounds of nitrate of soda. About 25 percent of the soil has been limed with 1½ tons of ground limestone an acre. A wide range exists in corn yields. Corn yields 35 to 50 bushels an acre where it is heavily fertilized and limed and planted in rotations in which one or more leguminous crops are turned under to improve the soil. Unlimed areas planted mainly to corn and small grains and treated with 100 to 150 pounds of fertilizer an acre yield an average of 25 bushels of corn an acre; and unfertilized areas cropped exclusively to corn yield 15 bushels an acre.

The small grains are rye, wheat, and occasionally oats. About 10 percent of the rye is turned under for soil improvement; rye harvested for grain yields 10 to 16 bushels an acre. Wheat usually produces 10 to 15 bushels an acre, but in places as much as 20. About two-thirds of the acreage planted to small grains is fertilized. Superphosphate, the fertilizer most used, is applied for small grains at the rate of 100 to 200 pounds an acre.

Snap beans are generally grown on areas limed with 1 to 1½ tons of ground limestone an acre and fertilized with 200 to 400 pounds of 4-8-4. The 4-8-4 mixture is supplemented in places with 150 pounds of nitrate of soda. The yields range from 100 to 200 bushels an acre. Potatoes are fertilized with 600 to 800 pounds of 5-7-5 or 4-8-6 an acre, and the yields range from 100 to 160 bushels an acre. Cabbage is fertilized with about 500 pounds of 4-8-4 an acre, and the yields average 8 tons.

Lespedeza ordinarily is not fertilized when grown in rotation with fertilized crops, and the average yield of hay is 1¼ tons an acre. Soybeans are grown for hay to a small extent, and average yields are about the same as for lespedeza.

CONGAREE SERIES

The members of the Congaree series occupy well-drained areas in first bottoms, and in most places they are subject to overflow from adjacent streams. The alluvial materials from which they are derived were washed from soils on uplands underlain by granite, granite-gneiss, and micaceous schist and to a less extent by subbasic and basic metamorphic rock. The soils are most typical along streams in uplands lying at lower elevations than in the mountains from which a minor part of their parent alluvial material has come.

The 8- to 10-inch upper layer of Congaree soils is grayish brown or brown and friable. Underlying to a depth of about 33 inches is brown or yellowish-brown crumbly or loose material, below which is gray or mottled gray and brown material. In many places the upper layer has a reddish color caused by materials washed from red soils on the immediate slopes.

The soils are moderately micaceous, and slightly to moderately acid. The supply of organic matter is low, but the supply of essential plant nutrients is fairly high. Consistence of the soils permits easy pene-

tration by moisture, air, and roots. Moisture relations for crop production are good, but damage to crops by overflow from streams is to be expected from time to time. The soils are well suited to a variety of crops. The units mapped are silt loam and fine sandy loam.

Congaree silt loam (Co).—This brown mellow soil has formed from alluvial material consisting of sand, silt, and clay. The alluvium is derived from uplands underlain mainly by granite-gneiss and micaeous schist. The soil occupies first bottoms near streams, mostly along the Hiwassee River and Brasstown Creek, and is subject to overflow during heavy rains. It differs from Congaree fine sandy loam mainly in having a finer texture, a slightly less friable consistence, a better supply of plant nutrients, and a better water-holding capacity. Relief is level or nearly level. External drainage is slow and internal drainage is medium. Nearly all of this soil has been cleared and is in agricultural use.

Profile characteristics in a cultivated field:

- 0 to 8 inches, grayish-brown friable fluffy or moderately compact silt loam containing a fair quantity of organic matter; material is easily penetrated by moisture, air, and roots and is medium to strongly acid.
- 8 to 30 inches, brown crumbly silt loam easily penetrated by moisture, air, and roots; medium to strongly acid.
- 30 inches +, mottled gray and brown crumbly silt loam or fine sandy loam, pervious to moisture and air and easily penetrated by roots; medium to strongly acid.

The layers of the profile vary somewhat in thickness. In a few areas, especially those near stream banks and bordering Congaree fine sandy loam, the texture of the surface soil is loam.

The soil is relatively easy to work and to conserve, and its very good productivity is fairly easily maintained. Erosion control offers no problem, and moisture relations for plant growth are good. The soil has a somewhat narrower range of moisture conditions for cultivation and warms somewhat less rapidly in the spring than Congaree fine sandy loam and other sandy-textured soils.

Use and management.—Almost all of Congaree silt loam is used for crops. It is good to very good for crops and pasture and is especially well suited to corn. At least 80 percent is planted each year to corn. About 10 percent is used for truck and miscellaneous crops, 5 percent for permanent pasture, and 5 percent for timber. Wheat and rye are subject to winterkilling.

On land where corn is grown nearly every year, rye is seeded in the corn just before the last cultivation and plowed under the following spring for green manure. Some farmers grow crimson clover, which is considered a better green-manure crop than rye. In some areas a 3-year rotation of corn, wheat or rye, and red clover is used. In this rotation about $1\frac{1}{2}$ tons of ground limestone is applied an acre, and the corn crop is fertilized with 150 to 200 pounds an acre of 2-10-2 or 4-8-4. Under common management corn yields about 35 bushels an acre; wheat, 16; rye, 14; and red clover, $1\frac{1}{4}$ tons of hay. With better management practices, corn yields average 55 bushels an acre; wheat, 23; rye, 20; and red clover, 2 tons of hay.

This soil is well suited to truck crops. Under common management, potatoes and snap beans average 120 bushels an acre. With better

management practices potatoes average 180 bushels an acre, and snap beans, 210 bushels.

Congaree fine sandy loam (C_F).—This soil is in first bottoms subject to overflow by adjacent streams and is derived from alluvial material washed from uplands underlain by granite-gneiss and micaceous schist. It is brown and friable and well suited to truck and general crops. Relief is level or nearly level, as slopes are generally not more than 2 percent. External drainage is slow and internal drainage is medium. Practically all of the acreage lies along the Hiwassee River and Brasstown Creek and has been cleared for agricultural use.

Profile characteristics in a cultivated field:

- 0 to 10 inches, grayish-brown friable fine sandy loam; material low in organic matter content and loose and easily penetrated by roots; wooded areas have slightly more organic matter than cultivated fields; medium to strongly acid.
- 10 to 36 inches, brown or yellowish-brown friable loose fine sandy loam, the loose consistence permitting free air and moisture movement and easy penetration of roots; medium to strongly acid.
- 36 inches +, mottled brown and gray friable fine sandy loam underlain at variable depths by crumbly silt loam or by well-rounded channel gravel.

The layers of the profile vary somewhat in thickness from place to place. In a number of small areas bordering the Hiwassee River, the upper soil is an overwash of loamy fine sand or loamy sand, which is less productive for most crops than the fine sandy loam. These small sandy areas are shown on the soil map by symbol.

Congaree fine sandy loam is practically stone free and can be easily tilled and cultivated over a fairly wide range of moisture conditions. It warms comparatively early in spring; moisture relations are fairly good for plant growth; and the supply of essential plant nutrients is high. The soil material and essential plant nutrients can be easily conserved.

Use and management.—Congaree fine sandy loam is good to very good crop and pasture land. It is used for corn, rye, wheat, crimson clover, red clover, lespedeza, and sweet sorghum.

The well-drained condition, favorable texture, and large supply of available plant nutrients make the soil well suited to corn, the principal crop. Rye is seeded just before the last cultivation of the corn in many areas and is plowed under during spring to build up the supply of organic matter in the soil. Some farmers substitute crimson clover for rye, as they prefer it for green manure. On land used for a small-grain crop, a 3-year rotation of corn, wheat or rye, and red clover is commonly preferred. In this rotation, 1 ton of ground limestone an acre generally is applied to reduce the acidity.

Corn is fertilized with 150 to 200 pounds an acre of 2-10-2 or 4-8-4 and yields 25 to 40 bushels an acre. Where the soil has been covered with recent overwash of sand, corn yields much less, or about 20 bushels an acre. Because of flood hazards, rye and wheat are rarely kept on the land until harvested for grain. When they are harvested for grain, both crops average 15 bushels an acre. In better than ordinary crop years wheat yields as much as 20 bushels an acre, and rye, as much as 18 bushels. Red clover and lespedeza yield 1½ to 1¾ tons of hay an acre. Sweet sorghum averages 150 gallons an acre of good quality sirup.

Tomatoes, potatoes, sweetpotatoes, lettuce, cabbage, carrots, and snap beans are truck crops that do well. Lettuce, tomatoes, and cabbage need light applications of lime. Sweetpotatoes are best suited to the sandy overwash areas.

FANNIN SERIES

Soils of the Fannin series have a grayish-brown to reddish-brown surface soil and a red subsoil and are underlain by micaceous schist rock at a depth of 3 to 5 feet. They have a better developed subsoil, more depth to weathered rock material, and a less micaceous parent rock than Talladega soils. Fannin soils rarely are on slopes steeper than 30 percent; Talladega soils generally do not have slopes of less than 15 percent. Fannin soils of favorable slope and undamaged by misuse and poor management make good cropland. In contrast, Talladega soils dry easily and are either generally unsuited to crops or of low quality for crop use. In virgin areas Fannin soils have a loam surface soil, but in cleared areas where misuse of the land has resulted in accelerated erosion, the texture is clay loam.

The members of this series are Fannin loam, rolling phase; the eroded rolling, eroded hilly, and severely eroded hilly phases of Fannin clay loam; and Fannin-Talladega loams, hilly phases.

Fannin loam, rolling phase (FLN).—The micaceous schist that has given rise to this brown mellow soil has contributed many small mica flakes to the profile and is responsible for the red micaceous subsoil. The small total area of this phase occurs on the Hiwassee Plateau, mainly near Young Harris, and in the northwestern part of the county. The soil is associated with other Fannin soils and with Talladega soils; about 10 percent is stony loam. It is typically developed on ridge tops and has gently undulating to rolling relief. Slopes may be as great as 15 percent but average 10 percent. External and internal drainage are both classified as medium, but external drainage is rapid in some places.

Profile description of a forested area:

- 0 to 3 inches, dark grayish-brown friable mellow loam; dark color is due to the presence of organic matter.
- 3 to 8 inches, grayish-brown friable mellow loam; material low in organic-matter content, easily permeable to moisture and air, and freely penetrated by roots; medium to strongly acid. (In cultivated areas the plow layer has lost most of the dark color through cultivation and is grayish brown or light grayish brown.)
- 8 to 12 inches, reddish-brown crumbly light clay loam.
- 12 to 33 inches, red highly micaceous heavy clay loam, dense, moderately plastic, and slick or greasy to the touch; material readily broken into small irregularly shaped aggregates that can be pressed fairly easily into short smooth ribbons; density not great enough to prevent root penetration, but fewer roots enter than do in the first two layers; layer easily pervious to moisture and air and its uniform red color indicates a highly oxidized condition of iron compounds and a general absence of waterlogging; strongly acid.
- 33 to 48 inches, red soft highly micaceous clay loam, definitely lighter than that of the overlying layer; penetrated by only a few of the larger tree roots.
- 48 inches +, dark greenish-red or red weathered micaceous schist.

Throughout the extent of this soil the profile layers vary somewhat in thickness.

This loam is fairly easy to work and conserve and is moderately productive. It has a lower organic-matter content and a lower supply of essential plant nutrients than the Porters, Balfour, Rabun, and like soils that occur on mountains. Moisture relations are fairly good for plant growth, and the land can be cultivated over a relatively wide range of moisture conditions.

Use and management.—Nearly all of Fannin loam, rolling phase, is in forest consisting mainly of various species of oaks, but it is fair to good for crops and good for pasture. The cleared soil is well suited to corn, small grains, legumes, potatoes, snap beans, and other vegetables. The forested soil may be considered as reserve cropland that can be cleared for use if and when more cropland is needed. Where forested areas are cleared for crops, they should be protected against erosion by terracing, strip cropping, or use of crop rotations containing winter cover crops.

Fannin clay loam, eroded rolling phase (Fcg).—This soil is similar to Fannin loam, rolling phase, but it is eroded and has a heavier surface soil. The eroded condition resulted mainly from cultivation without erosion control measures. The 5- to 6-inch plow layer is a mixture of surface soil and subsoil materials to which the subsoil material has given a reddish color. It contains sufficient clay to be dense and crumbly instead of friable and mellow like the plow layer of Fannin loam, rolling phase.

The phase occupies ridge tops in association with hilly phases of Fannin soils and with Talladega soils. Nearly all of it is near Young Harris and in the northwestern part of the county. Relief is gently rolling to rolling; the slopes range from 7 to 15 percent but average 10 percent. External drainage is medium to rapid and internal drainage is medium.

The 82 acres of eroded stony clay loam included are as productive as the nonstony soil, but have a lower agricultural value because of the mechanical difficulties involved in farming stony land. A small acreage, indicated on the soil map by symbol, is severely eroded clay loam having a lower agricultural value than the eroded stony clay loam.

Another inclusion is about 75 acres of somewhat different soil occurring mainly in the northwestern part of the county southwest of Many Forks Church. It is similar to Fannin loam, rolling phase, but has a higher content of mica flakes and is relatively shallow to bedrock. Many small fragments of mica schist are on the surface and in the soil. Most of this included soil is on ridge tops having 7 to 15 percent slopes. Areas located where the ridge tops are very narrow are suitable only for forest; areas favorably located with respect to other cultivated land are used for corn, rye, and lespedeza. Yields are somewhat lower than on Fannin clay loam, eroded rolling phase, under similar management.

Fannin clay loam, eroded rolling phase, is fairly easily worked but has less favorable tilth conditions than Fannin loam, rolling phase, and more power is required for ordinary tillage operations and for the preparation of a good seedbed. The range of moisture conditions is also less. The surface layer is less permeable to plant roots, and crops

are more likely to be injured by drought during dry periods. Conservability is difficult and productivity is fair.

Use and management.—About 70 percent of Fannin clay loam, eroded rolling phase, is used for crops; 5 percent is in improved permanent pasture; 10 percent is lying idle; and 15 percent is in shortleaf pine. Corn, rye, and lespedeza are the principal crops. The soil is poor to fair for crops and fair for pasture.

Past cropping practices on much of this soil were not beneficial. In many areas corn was planted year after year without fertilizer and cover crops; in others corn and rye were grown in alternate years. These practices resulted in rapid soil depletion, and consequently corn yields dropped to an average of less than 10 bushels an acre in many fields. Some areas were cropped until fertility was almost gone and then allowed to remain idle or to become covered with shortleaf pine. Many such areas have again been cleared for cultivated crops, and in a few places this cycle has been repeated a number of times. Accelerated erosion is very active, causing much loss of soil material and unfavorably affecting the physical and chemical qualities of the soil.

Crop rotations made up of corn, rye, and legumes are largely used at present. The rotation in common use is corn, rye seeded in the corn, and later, lespedeza seeded in the rye. The rye is harvested for grain the year following the harvest of the corn, and the lespedeza is allowed to remain on the land for improving the soil. The next year corn is planted again, or the lespedeza is allowed to reseed the land for pasture use. A crop of crimson clover or cowpeas is sometimes substituted for lespedeza in the rotation and is turned under for green manure.

In the commonly used rotation just described corn receives 100 to 200 pounds an acre of 2-10-2 or 4-8-4 or the same quantity of superphosphate. Rye, when fertilized, receives 100 pounds of superphosphate an acre. Lespedeza generally is not fertilized, but many fields on which it is grown are limed with 1 to 1½ tons an acre of ground limestone every 5 or 6 years. Barnyard manure when available is applied to cornland.

Under these better practices of management, corn produces 20 to 35 bushels an acre; rye, where fertilized, 10 to 15 bushels; rye not fertilized, 8 to 10 bushels; and lespedeza, 1½ to 2 tons of hay. Where corn follows a leguminous green-manure crop and is given heavy applications of fertilizer, yields may be as high as 50 bushels an acre.

Snap beans are grown as a truck crop on a few areas. They are fertilized with 300 to 500 pounds an acre of 5-7-5 and generally are followed by a small-grain crop or by lespedeza. Under these better management practices snap beans produce 100 to 175 bushels an acre, or an average of 165 bushels.

Fannin clay loam, eroded hilly phase (Fco).—This phase is associated with other Fannin soils. It differs from Fannin clay loam, eroded rolling phase, mainly in having stronger slopes (15 to 30 percent). Originally the surface layer was similar in color, texture, and consistence to that of Fannin loam, rolling phase. Practically all the soil has been in agricultural use at some time, but use and management were not properly adjusted to soil requirements and

considerable accelerated erosion resulted. The surface soil is 3 to 6 inches thick; the plow layer is a mixture of surface soil and subsoil material. In places where little erosion has taken place the material is reddish-brown gritty loam but in the more eroded areas it is brownish-red or red gritty clay loam.

External drainage is rapid and internal drainage is medium. Gullies have formed in many places and deep ones are indicated on the soil map by symbol. Strong slopes and poor tilth make the soil difficult to work and result in rapid runoff, which reduces the ability of the soil to absorb and hold moisture. Productivity is generally low.

A few areas of Fannin stony clay loam, eroded phase, are included with this soil and are indicated on the soil map by symbol.

Use and management.—Fannin clay loam, eroded hilly phase, is very poor to poor for crops but fair for pasture. About 20 percent of the land is cultivated, 5 percent is in pasture, 50 percent is lying idle, and 25 percent is in shortleaf pine.

Farmers that do not have a sufficient acreage of the better soils for producing crops use this one for corn and to some extent for rye and lespedeza. Corn is grown year after year without the use of fertilizer and cover crops, and under this practice depletion of soil fertility is rapid. The yields of corn are relatively low, ranging in most places from 5 to 8 bushels an acre. Rye yields 5 to 10 bushels an acre, but the average is 6 bushels. Lespedeza yields $\frac{1}{2}$ to $1\frac{1}{2}$ tons of hay and averages about $\frac{1}{2}$ ton.

On some farms good management practices are followed, especially in the production of lespedeza and pasture, and in some areas erosion is controlled by terraces or by contour tillage.

Practically all of this soil would grow good pasture if it were seeded with mixed pasture plants and lime and superphosphate were liberally applied. It is estimated that 3 acres of well-established pasture would supply grazing for one cow. In areas where a durable leguminous cover is desired, sericea lespedeza should be a satisfactory crop. Where the soil is in a good condition of fertility, 2 to 3 cuttings of hay, ranging from $\frac{1}{2}$ to 1 ton an acre each, can be expected in a single season.

Fannin clay loam, severely eroded hilly phase (FCE).—After this hilly soil was cleared for cultivation, accelerated erosion removed all or nearly all of the original surface soil and exposed the heavy clay loam subsoil over three-fourths or somewhat more of the area. Tilth conditions are poor, and the plowed layer is less easily penetrated by plant roots than that of Fannin loam, rolling phase. Shallow gullies have formed in many places, and although these can be plowed across, plowing will not completely efface them. The deep gullies are indicated on the soil map by symbol.

This phase occupies slopes of 15 to 30 percent and has very rapid external and medium internal drainage. The areas are 10 acres or less in size, and most of them are near Young Harris and in the northwestern part of the county.

Use and management.—About 80 percent of Fannin clay loam, severely eroded hilly phase, is lying idle; the rest supports a growth

of shortleaf pine. Workability is difficult; conservability, very difficult; and productivity, very poor.

It would be feasible to use some areas for sericea lespedeza and kudzu, but because of severity of erosion, strong slopes, and present economic conditions, most areas are best used for forest.

Fannin-Talladega loams, hilly phases (FT_H).—This complex is composed of areas of Fannin and Talladega soils so intricately associated in development that it is not feasible to separate them on the soil map. It is mainly in the northwestern part of the county on hilly areas in the Hiwassee Plateau. In most areas the Fannin soil makes up the greater part of the complex, but in the vicinity of Gumlog School the Talladega soil predominates.

The Fannin soil has a 6- to 8-inch surface layer. In forested areas this layer is dark grayish-brown mellow loam to a depth of 2 or 3 inches, below which it is grayish-brown mellow loam. The darker color in the upper part is due to the presence of a large quantity of decayed organic matter. In cultivated areas the surface soil is light grayish brown. The Fannin subsoil begins as reddish-brown crumbly light clay loam and at a depth of about 12 inches changes to red highly micaceous heavy clay loam. In the lower part the subsoil consists of red soft micaceous light clay loam, grading at a depth of about 48 inches into dark greenish-red or red weathered micaceous schist.

The Talladega soil generally is shallower to weathered rock material than the Fannin. In forested areas the surface soil to a depth of 2 or 3 inches consists of dark grayish-brown or dark-brown friable mellow loam containing a fairly large quantity of decayed organic matter; below this is reddish-brown friable mellow loam that continues to a depth of about 10 inches. In cultivated areas the surface soil is slightly reddish brown to reddish brown. The subsoil is red or yellowish-red friable highly micaceous clay loam to an average depth of 28 inches, where it gives way to red material derived from weathered micaceous schist.

Slopes for the complex range from 15 to 30 percent. External drainage is medium to rapid and internal drainage is medium. The few small stony areas are indicated on the soil map by symbol. Accelerated erosion has removed much of the original surface soil in some cultivated areas, and fragments of micaceous schist rock are scattered over the surface. In these eroded areas the plow layer is brownish-red or slightly brownish-red clay loam consisting partly of subsoil material.

This complex can be fairly easily worked. It is relatively difficult to conserve, and the control of erosion is an important problem. It is very poor to poor for crops and fair for pasture.

Use and management.—Nearly all of Fannin-Talladega loams, hilly phases, is in forest consisting of various oaks, other deciduous trees, and some shortleaf pine. A small part is lying idle, and a very small part is used for crops and pasture, yields of which are low. Some areas of forested land and idle land are used as cattle range, but the carrying capacity is low.

More of this land could be cleared and used for leguminous crops and pasture. Although it is unsuitable for crops requiring tillage, mainly because of its hilly relief and ease of erosion, the land is suit-

able for permanent pasture if proper management, including the use of lime and phosphate, is practiced. If properly managed, 3 to 5 acres will supply grazing for one cow. Lespedeza and Bermuda grass are better adapted pasture plants than bluegrass, and if they are well established, will hold the soil and greatly reduce erosion.

Although apples and peaches are not grown on a commercial basis on this complex, some areas of it, particularly those on north-facing slopes, are suitable for their production if factors other than the suitability of the soil are considered before growing them. Grapes possibly could be produced commercially on some areas.

HAYESVILLE SERIES

Soils of the Hayesville series have a dark grayish-brown to reddish-brown surface soil and a red subsoil similar in color to that of the Fannin soils. The depth of the profile to bedrock (5 to 8 feet) is greater than that of Fannin soils (less than 5 feet), and the subsoil is more porous and crumbly than in the Fannin soils. The Hayesville soils have formed from weathered granite-gneiss rock, the Fannin from weathered micaceous schist rock. Because of this difference in rock, the Hayesville profile is less micaceous than the Fannin. Where Hayesville and Fannin soils have similar relief and erosion, the Hayesville soils are more productive. Hayesville soils are extensive in the farming areas (pl. 1, B), except in the northwestern corner of the county. Accelerated erosion has affected the use and management of a large total acreage.

The Hayesville series is represented by more units than any other in the county. The following units are mapped:

Hayesville loam:	Hayesville clay loam:
Hilly phase	Eroded hilly phase
Rolling phase	Severely eroded hilly phase
Steep phase	Eroded rolling phase
Eroded undulating phase	Severely eroded rolling phase
Hayesville stony loam:	Eroded steep phase
Hilly phase	Severely eroded steep phase
Rolling phase	Hayesville stony clay loam:
Steep phase	Eroded hilly phase
	Severely eroded hilly phase
	Eroded rolling phase

Hayesville loam, hilly phase (HLH).—This extensive soil, characterized by a brown friable surface soil and a red clay loam subsoil, occurs throughout the central part of the county on hilly areas with 15- to 30-percent slopes. The soil has developed on weathered material from granite-gneiss and has a comparatively deep profile. Its profile is less micaceous than that of Fannin loam, rolling phase. External drainage is medium to rapid and internal drainage is medium.

Profile characteristics in a cultivated field:

0 to 7 inches, grayish-brown to light-brown friable gritty loam containing a fairly large quantity of organic matter and easily penetrated by moisture, air, and roots; under virgin conditions layer is dark grayish-brown or dark-brown friable gritty loam, generally containing more organic matter than the plowed soil, and is covered by a very thin layer of partly decayed leaves, twigs, and other vegetable matter; a great many small roots are in the upper inch or two; medium to strongly acid.

- 7 to 11 inches, brownish-red crumbly soft light clay loam; low organic-matter content; easily penetrated by moisture, air, and roots; medium to strongly acid.
- 11 to 32 inches, red slightly micaceous heavy clay loam; material easily crushed into soft medium-sized crumbs, contains small dark-gray and grayish-green soft concretions, and has ample pore space for movement of moisture and air; uniform red color indicates good oxidation; medium to strongly acid.
- 32 inches +, light-red friable clay loam; material is lighter, more micaceous, and less well oxidized than the clay loam of the overlying layer; contains numerous small concretions and is underlain at variable depths by soft decomposed granite-gneiss.

Throughout the extent of this soil the layers of the profile vary somewhat in thickness. Minor variations in texture, consistence, and other characteristics occur from place to place.

The workability, conservability, and productivity of this soil are fair. The steep slopes make tillage and the control of runoff more difficult than on many soils of milder relief. The soil is reasonably well supplied with essential plant nutrients and has a fairly good water-holding capacity.

Use and management.—Nearly all of Hayesville loam, hilly phase, is in oak and mixed forest; only a very small acreage has been cleared for agriculture. The forested areas, however, may be considered as a reserve that could be cleared and seeded to bluegrass, white clover, and lespedeza for pasture. With proper management, including the use of lime and phosphate, fairly good pasture can be maintained. The soil is rated as poor for crops but good for pasture.

Hayesville loam, rolling phase (HLN).—This phase occurs on ridge tops, chiefly north and northwest of Hiwassee, and differs from the hilly phase mainly in having milder relief. Slopes range from 8 to 15 percent, and external and internal drainage are medium.

In forested areas the 7- to 8-inch surface soil is dark grayish-brown or dark-brown friable gritty loam containing a fairly large quantity of organic matter. A subsurface layer of brownish-red crumbly light clay loam 2 to 5 inches thick lies between the surface soil and subsoil. The subsoil is red slightly micaceous heavy clay loam containing some small dark concretions. At a depth of about 32 inches the subsoil grades into light-red parent material consisting of friable clay loam that is more micaceous and contains more concretions than the subsoil.

This soil is easily worked and conserved, and it produces well the crops commonly grown. Pore space is ample for the movement of air and moisture, and the deep profile holds an adequate supply of moisture. Both the surface soil and subsoil are medium to strongly acid, but the subsoil in most places is a little more acid.

Use and management.—Although practically all of Hayesville loam, rolling phase, is in forest of oaks and other deciduous trees, areas could be cleared for agricultural use if needed. The soil is fair to good for crops and good for pasture. The yields of crops and pasture would be in general a little higher than those on Hayesville clay loam, eroded rolling phase, an extensive agricultural soil in the county.

This phase is well suited to general farm crops, and snap beans, potatoes, and other vegetables. Precautions are necessary for the control of erosion on cleared areas; and terracing, strip cropping, and close-growing winter cover crops are considered effective.

Hayesville loam, steep phase (HLz).—Except for steeper slopes (30 to 60 percent) and in some places a thinner surface soil and subsoil, this phase is similar to Hayesville loam, hilly phase. It has rapid external drainage and when cleared of forest is subject to severe erosion. Internal drainage is medium. Most of this soil is in areas of 50 to 100 acres on the lower slopes of mountains and along the Hiwassee River. Chiefly because of the strong slope, workability is fair to poor and conservability is difficult. Productivity is fair. The control of erosion is an important problem where this soil is cleared of forest and used for crops and pasture.

Use and management.—Practically all of Hayesville loam, steep phase, is in oak forest or in mixed forest of deciduous trees and pines. Steepness and other unfavorable qualities make this soil very poor for crops and very poor to poor for pasture. Its best use is for forest.

Hayesville loam, eroded undulating phase (HLT).—In uneroded areas this phase differs from the hilly and rolling phases of Hayesville loam in having gentler slopes of 2 to 7 percent. Accelerated erosion has removed one-half to three-fourths of the original surface soil from about 45 percent of the total area, and in some places the plowed layer consists of brown surface soil mixed with red subsoil material. Some areas have numerous rock fragments on and in the surface soil.

This phase occupies small areas on broad ridge tops, mainly near Bell Creek and north of Hiwassee. It has slow to medium external drainage and medium internal drainage. The soil is easy to work and conserve and is one of the most productive in the uplands.

Use and management.—About 25 percent of Hayesville loam, eroded undulating phase, is covered with oak and other deciduous trees; the rest is used principally for corn, wheat, and lespedeza and to a small extent for crimson and red clovers. The favorable qualities of this soil make it fair to good for crops and good for pasture.

The crop rotations are made up of corn, wheat, and lespedeza. In some areas, crimson clover or red clover is substituted for lespedeza, and this is done when the land is treated with 1 to 1½ tons of ground limestone an acre. Crimson clover may be seeded in the corn at the last cultivation and turned under the following spring before corn is again planted. Land for corn generally is fertilized with 100 to 200 pounds an acre of 4-8-4; wheatland receives similar quantities of superphosphate. Under common management corn produces an average of 23 bushels an acre; wheat, 15 bushels; and lespedeza and red clover, each 1¼ tons of hay.

Hayesville stony loam, hilly phase (HSh).—This phase has profile characteristics similar to the hilly phase of Hayesville loam, but differs in having a large number of rock fragments, up to 6 inches in diameter, on the surface and in the soil. External and internal drainage are medium.

Tillage is difficult because of the strong slopes (15 to 30 percent) and stoniness of the soil. Both soil material and plant nutrients are fairly easily conserved, and the moisture-holding capacity is fairly good.

Use and management.—Hilly relief, stoniness, and other unfavorable features make Hayesville stony loam, hilly phase, poor for crops but it is fair to good for pasture. Nearly all of the land is used as

a source of wood for farm use or as woodland pasture. Tree growth consists mainly of various species of oak and other deciduous trees. The carrying capacity of woodland pasture is low, but good pasture can be established on cleared areas by seeding to improved varieties of pasture plants and by proper fertilization and liming.

Hayesville stony loam, rolling phase (Hsn).—In color, texture, and consistence this phase is similar to Hayesville loam, hilly phase, but slopes are more gentle (7 to 15 percent) and rock fragments are present on the surface and in the profile. These fragments range up to 6 inches in diameter and are sufficiently numerous to interfere materially with cultivation. Both external and internal drainage are medium.

This soil is less desirable for tillage than Hayesville loam, rolling phase, because of stoniness, although it is fairly easy to work. The supply of organic matter is moderate, and the moisture-holding capacity is fairly good. Conservation is fairly easy to accomplish, and productivity is moderate.

Use and management.—Only a very small acreage of Hayesville stony loam, rolling phase, is cleared. In the uncleared areas oaks and other deciduous trees are most common. The soil is fair to good for crops and good for pasture. It is well suited to general farm crops, and if it were cleared and cropped under similar management, yields would be about the same as for Hayesville loam, rolling phase. Management requirements are also about the same.

Hayesville stony loam, steep phase (Hsz).—Although its color, texture, and consistence resemble those of Hayesville loam, hilly phase, this soil has steeper slopes (30 to 60 percent), stoniness, and in places thinner profile layers. It occupies lower slopes of mountains, and the individual areas are relatively large. Many rock fragments up to 6 inches in diameter on the surface and in the profile make the soil stony. External drainage is rapid and internal drainage is medium.

The steep slopes and stoniness make the soil nearly everywhere unsuitable for ordinary tillage and it is very difficult to conserve when cleared of forest. Productivity is relatively low.

Use and management.—Practically all of Hayesville stony loam, steep phase, is in forest of various oaks, other deciduous trees, hemlock, and white and shortleaf pines. The soil is very poor for crops and very poor to poor for pasture land because of its unfavorable external features. Forest is its most feasible use.

Hayesville clay loam, eroded hilly phase (Hco).—This phase is associated with other Hayesville soils and consists of areas that were formerly Hayesville loam, hilly phase. Accelerated erosion, caused mainly by misuse of the soil, has removed the original surface soil to a variable depth. Otherwise, the two soils have similar profiles.

The plow layer, a light to heavy clay loam, is reddish brown where a small quantity of subsoil material is intermixed with it and brownish red or red where much is intermixed. External drainage is medium to rapid and internal drainage is medium. The soil is difficult to work and to conserve and low in productivity. As it is subject to further loss of material by erosion, control of runoff is of primary importance in its management.

Use and management.—All of the eroded hilly phase of Hayesville clay loam has been used at various times for cultivated crops. It is a poor soil for crops but fair to good for pasture. Corn has been grown in many areas for several years in succession. Without commercial fertilizer to stimulate plant growth and cover crops to protect against erosion, the loss of soil material has been rapid.

Approximately 40 percent of the total area is idle; 20 percent, cultivated; 10 percent, in pasture; and 30 percent, in shortleaf pine. The soil is used for crops on many farms where better farm land is scarce.

Corn, rye, wheat, and lespedeza are the main crops. Where corn is planted for several years in succession, it produces relatively low yields, or 6 to 9 bushels an acre. Corn fertilized and rotated with small-grain and leguminous crops yields as much as 14 bushels an acre. Fertilizer is used to a limited extent; but when it is used, corn receives 100 to 150 pounds an acre of superphosphate or 4-8-4, and rye and wheat, 100 pounds of superphosphate. Rye and wheat produce 5 to 8 bushels an acre each, and lespedeza, about $\frac{1}{4}$ ton of hay. Ordinarily the carrying capacity of pasture is relatively low, but with better management practices it could be greatly increased. The large acreage lying idle or abandoned to shortleaf pine is evidence of the generally unfavorable returns that have been obtained under the management commonly practiced.

Red clover, bluegrass, and white clover respond readily if 1 to 1½ tons of ground limestone an acre and large quantities of superphosphate are applied. The poor tilth conditions could be improved by use of leguminous green manure. Heavy applications of lime and superphosphate should be beneficial in growing green-manure crops. Areas lying on north-facing slopes offer possibilities for orchard sites, except where erosion might become severe.

Hayesville clay loam, severely eroded hilly phase (HCE).—This phase is composed of areas that were once Hayesville loam, hilly phase, from which practically all the original surface soil has been removed by accelerated erosion. In many places gullies have cut into the upper part of the subsoil. The plow layer is composed almost entirely of subsoil material consisting of brownish-red or red friable gritty clay loam. Aside from its eroded conditions, this soil is similar to Hayesville loam, hilly phase. Slopes range from 15 to 30 percent. External drainage is very rapid and internal drainage is medium. Workability and conservability are difficult, and the supply of essential plant nutrients is low. The principal areas are northeast of Hiwassee.

Use and management.—Hayesville clay loam, eroded hilly phase, is poor for crops but fair for pasture. All of it has been in agriculture use at some time, but an estimated 60 percent is now lying idle. About 5 percent is seeded to permanent pasture, some 5 percent is used for crops, and approximately 30 percent is abandoned to shortleaf pine.

The control of erosion is one of the most important problems. A larger acreage could possibly be used for permanent pasture, although the most feasible use is forest. Among the requirements for the production of pasture are fairly heavy applications of ground limestone and heavy applications of superphosphate.

Hayesville clay loam, eroded rolling phase (Hcg).—A thinner and heavier surface soil resulting from accelerated erosion is the main difference between this phase and Hayesville loam, rolling phase. The soil occupies small areas on sloping ridge tops of 7 to 15 percent in association with steeper Hayesville soils.

The plow layer, a reddish-brown heavy loam or clay loam, is a mixture of surface soil and subsoil materials. In small patches all the surface soil is gone and the red heavy clay loam subsoil is exposed. External drainage is medium to rapid and internal drainage is medium.

The phase is fairly easy to work and to conserve. Its tilth, however, is poorer than that of Hayesville loam, rolling phase; its surface soil is more difficult for plant roots to penetrate; and it dries more rapidly in dry periods.

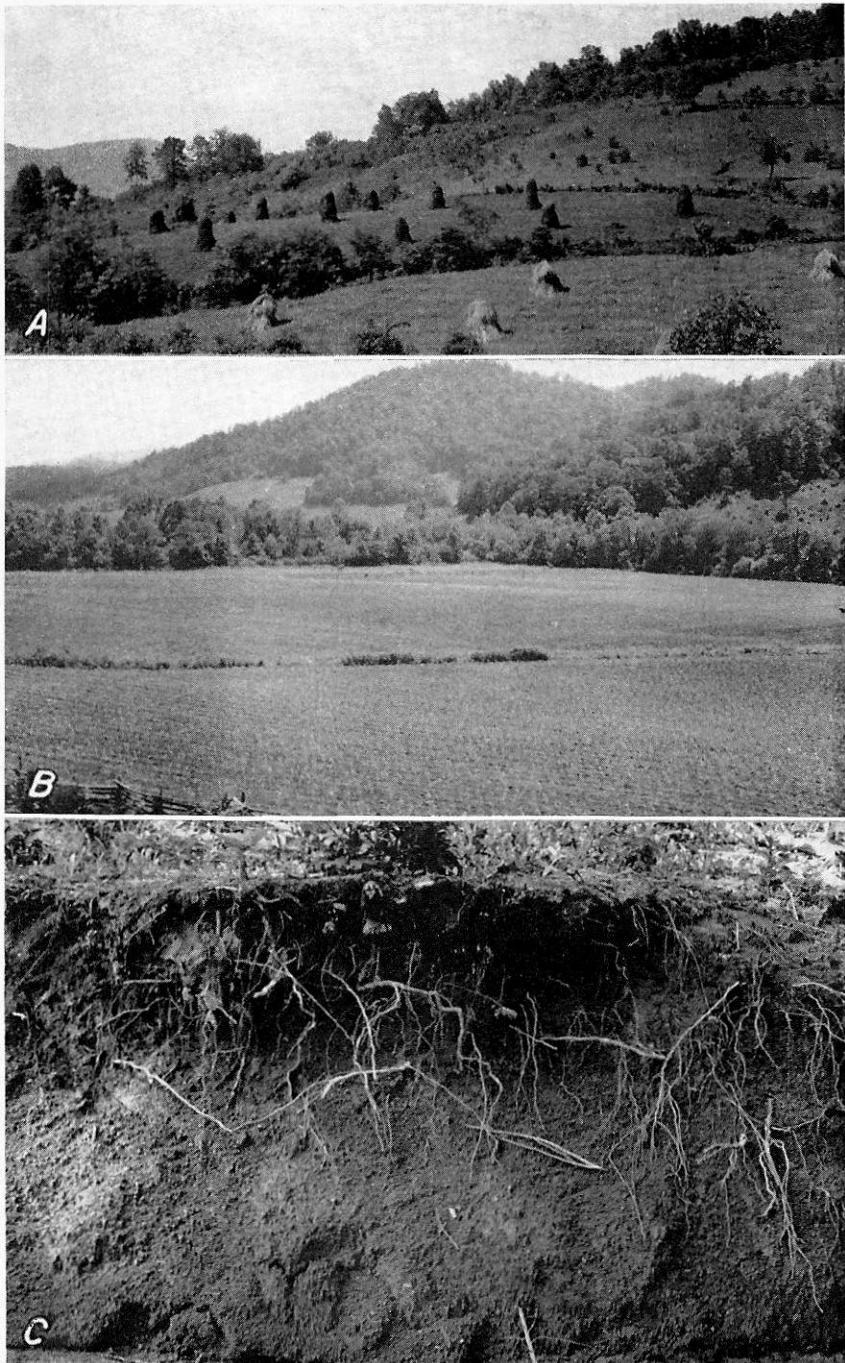
Use and management.—Hayesville clay loam, eroded rolling phase, is productive of the crops commonly grown and is rated as fair to good for crops and good for pasture. Under common management it will produce the following average acre yields of the principal crops: Corn, 18 bushels; rye, 13 bushels; and wheat 13 bushels (pl. 1, C). Rotations consist of corn, small grain following the corn, and lespedeza, crimson clover, or red clover following the small grain. With this rotation a cover is kept on the land most of the year.

Lespedeza yields about 1 ton of hay, and red clover, about $\frac{1}{2}$ ton. The fertilizer treatment for corn is 100 to 200 pounds an acre of 4-8-4; wheat receives 100 to 200 pounds of superphosphate. When rye is fertilized, it receives about the same quantities of superphosphate as wheat. If crimson clover or red clover is grown in the rotation instead of lespedeza, the land is limed with 1 to $1\frac{1}{2}$ tons of ground limestone an acre. Other management practices are terracing of most cultivated land and strip cropping of a few areas.

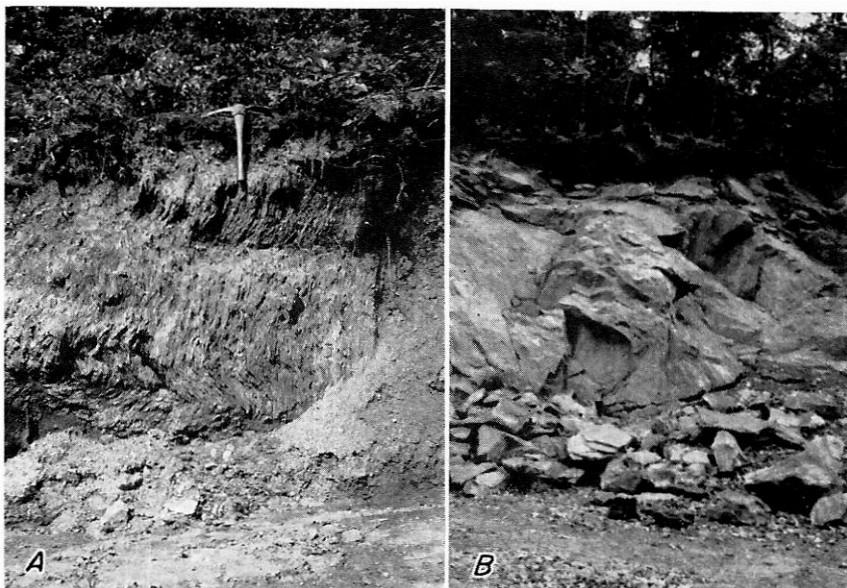
Hayesville clay loam, severely eroded rolling phase (Hcs).—This phase is composed of areas that were once Hayesville loam, rolling phase, from which accelerated erosion has removed a large part of the original surface soil. In half of the total area, the plowed layer is mainly subsoil material consisting of brownish-red gritty clay loam. Elsewhere, the surface soil has been entirely removed and the red gritty heavy clay loam subsoil is exposed. Shallow gullies in many places further affect the suitability of the soil for crops. The slopes are 7 to 15 percent. The soil occurs in small areas, usually in the northern part of the county. Tilth conditions are poor, productivity is low, and control of erosion is difficult.

Use and management.—Hayesville clay loam, severely eroded rolling phase, is poor to fair for crops and fair for pasture. About 25 percent is used mainly for corn, which commonly produces about 10 bushels an acre. About 50 percent is idle, and supports only a growth of broomsedge, blackberry bushes, dewberry vines, smilax, and small shortleaf pines. The rest is covered with young shortleaf pine, mixed in some areas with young oaks.

Proper management of this soil, including crop rotations, heavy applications of fertilizer, and engineering measures to control erosion, would enable production of satisfactory yields of corn, small grains, legumes, and pasture (pl. 3, A).



A, Rye and mammoth red clover on the severely eroded rolling phase of Hayesville clay loam, brought back to a stage of relatively high productivity by good management.
B, Row crops of corn, cabbage, and snap beans on an artificially drained area of Toxaway silt loam.
C, Cut through Hayesville loam, hilly phase, a red easily permeable soil about 5 feet deep to bedrock.



A, Exposure of the shallow Talladega soils on highly foliated mica schist, the parent rock of both the Talladega and Fannin soils.
B, Stony Porters soil developed over granite-gneiss rock; the Hayesville and Balfour series have also developed over granite-gneiss.

Hayesville clay loam, eroded steep phase (Hcf).—Accelerated erosion brought about by cultivation has removed a considerable part of the original surface soil from this phase. The present surface soil in most areas is 3 to 6 inches thick, and the plow layer is a reddish-brown, brownish-red, or red clay loam containing variable admixtures of subsoil material. In some areas the soil is so much eroded that little of the original surface soil remains.

The individual areas are 10 to 25 acres in size and are distributed throughout the central and northern parts of the county. About half of the soil is stony. It is difficult to work and to conserve and is low in productivity.

Use and management.—Owing to unfavorable external features, Hayesville clay loam, eroded steep phase, is very poor for crops and very poor to poor for pasture. It is most feasibly used for forest. About 5 percent is used for crops; 10 percent is in pasture; 35 percent is idle land covered with broomsedge, blackberry, dewberry, smilax, and scattered young shortleaf pines; and 50 percent is thickly grown with shortleaf pine. Of the included stony soil about 40 percent is lying idle and the rest has been allowed to grow up in shortleaf pine. Crops and pasture return low yields under common management.

Hayesville clay loam, severely eroded steep phase (Hcp).—This phase is composed of steep areas, formerly of Hayesville loam, hilly phase, that have become severely eroded after being cleared of forest and cropped. The original brown friable surface soil has been removed in most places and the red subsoil material is exposed. In addition to being sheet-eroded, the soil has been badly gullied in most places. It is scattered over different parts of the county on slopes of 30 to 60 percent. External drainage is very rapid but internal drainage is medium. Tillage operations are difficult on the steep eroded slopes; conservation of soil material and plant nutrients is very difficult; and productivity is low.

Use and management.—An estimated 2 percent of Hayesville clay loam, severely eroded steep phase, is used for crops; 5 percent is in permanent pasture; 30 percent is idle land covered with broomsedge and other small wild plants; and about 63 percent is in shortleaf pines in various stages of growth. The soil is very poor for crops and very poor to poor for pasture. It is best suited to forest, and management requirements are mainly those for forestation rather than for crop and pasture production.

Hayesville stony clay loam, eroded hilly phase (Hto).—In most respects this soil is similar to Hayesville clay loam, eroded hilly phase, but it has many 3- to 6-inch angular rock fragments on the surface and in the profile. These fragments consist of granite-gneiss, quartzite, and quartz, and are present in sufficient numbers to affect tillage. Accelerated erosion is in most places so advanced that a large part of the original dark grayish-brown or dark-brown loam surface soil is gone, and in some places reddish subsoil material is mixed with the plow layer. Slopes range from 15 to 30 percent. External drainage is medium to rapid and internal drainage is medium.

Strong slopes, poor tilth, and many stones make cultivation difficult. The soil material and plant nutrients are not easily conserved, and productivity is relatively poor.

Use and management.—The eroded hilly phase of Hayesville stony clay loam is poor cropland because of unfavorable characteristics for crop use, but it makes fair pasture land. It was once in crops, but only a small part is so used at the present time. All percentages being estimated, 15 percent of this phase is cultivated, 5 percent is in permanent pasture, 50 percent is lying idle, and 30 percent is grown over with shortleaf pine.

Corn is the principal crop; rye, wheat, and lespedeza are of minor importance. The management practices and yields of crops and pasture are about the same as those for Hayesville clay loam, eroded hilly phase.

Hayesville stony clay loam, severely eroded hilly phase (HTE).—This soil has been affected to a much greater degree by accelerated erosion than has Hayesville stony clay loam, eroded hilly phase. Three-fourths to all of the original loam surface soil has been washed off and many more rock fragments are on the surface and in the soil. In many areas much subsoil has been removed by sheet erosion, and the soil has been considerably gullied. Relief is hilly (15 to 30 percent slopes). External drainage is rapid to very rapid and internal drainage is medium. Most areas are 10 to 20 acres in size.

The soil is very difficult to work and to conserve and has lost most of its inherent fertility through cropping and resulting erosion.

Use and management.—Hayesville stony clay loam, severely eroded hilly phase, is very poor for crops and very poor to poor for pasture land because of its unfavorable physical characteristics. About 5 percent of the soil is in seeded or otherwise improved pasture. Approximately 50 percent is idle land thickly grown over with broomsedge, briars, and other wild plants. A large part of this idle land is grazed, but about 15 acres are required for grazing one cow. The rest of the soil has been allowed to grow over with shortleaf pine.

Owing to hilly relief, severe erosion, and depleted fertility, this soil is best used for forest. Some areas might be used for pasture land, especially those that reseed naturally or that give promise of profitable pasture if seeded.

Hayesville stony clay loam, eroded rolling phase (HTG).—Many 3- to 6-inch angular rock fragments on the surface and in the profile make this soil stony. These fragments consist of granite-gneiss, quartzite, and quartz and in some places on the surface they are well rounded. The rounding was done in the distant past when running water transported and deposited the fragments. Aside from its stoniness and milder relief, the soil is similar to Hayesville clay loam, eroded hilly phase. Accelerated erosion has been active to various degrees in most places and has removed a considerable part of the original surface soil. The plow layer consists of reddish-brown, brownish-red, or red light to moderately heavy clay loam, depending on the quantity of subsoil material mixed with it. There are small severely eroded areas in which nearly all or all of the original surface soil has been washed off.

This soil occurs mostly northeast of Hiwassee and on slopes of 7 to 15 percent. External drainage is medium to rapid and internal drainage is medium. The soil is difficult to work, but it is fairly easily conserved and its productivity is fair.

Use and management.—Moderately favorable characteristics make Hayesville stony clay loam, eroded rolling phase, fair to good for crops and good for pasture. Practically all of it is used for crops, principally corn, rye, wheat, and lespedeza. Crimson and red clovers are grown to some extent. In many areas corn has been planted year after year without the use of fertilizer and cover crops, and the result has been relatively low yields. In some areas corn is grown in rotation with rye or wheat and lespedeza. The corn in this rotation is fertilized with 100 to 150 pounds an acre of superphosphate, or 4-8-4; the rye and wheat, with similar quantities of superphosphate. With this management corn yields about 18 bushels an acre; rye and wheat, each about 13 bushels; and lespedeza about 1 ton of hay. Sometimes crimson clover or red clover is substituted for lespedeza in the rotation. Land for the clovers is limed with 1 to 1½ tons an acre of ground limestone.

HIWASSEE SERIES

Soils of the Hiwassee series are on high stream terraces that are apparently very old. The soils are characterized by their red color and well-developed profiles. Their surface soil ranges from dark brown to red and is mellow or friable. The subsoil consists of dark-red crumbly clay loam. Beneath the subsoil in the typical profiles is a thick layer of red crumbly clay loam, underlain by stratified deposits of well-rounded quartzite or chert gravel and larger water-worn stones.

The units of this series are the undulating, eroded undulating, and eroded rolling phases of Hiwassee loam; and Hiwassee-Hayesville stony loams, eroded hilly phases.

Hiwassee loam, undulating phase (HwU).—This soil occurs on high terraces near streams and is characterized by a dark reddish-brown surface soil and a dark-red subsoil. Farmers refer to it as push land because it will not turn easily from the moldboard. It occurs in small areas, usually less than 10 acres in extent, bordering the Hiwassee River or its bottom lands. It lies well above overflow, however, even during unusually heavy rainfall. A typical area is southwest of Hiwassee. It has 2- to 7-percent slopes, slow to medium external drainage, and medium internal drainage. The soil has formed from old alluvium consisting largely of sand, silt, clay, pebbles, and larger water-worn rock fragments. A large part has been cleared for agricultural use, and the trees in the uncleared areas are chiefly oaks.

Profile characteristics in a cultivated field:

- 0 to 9 inches, dark reddish-brown soft crumbly loam containing a relatively large quantity of organic matter; material is slightly to medium acid and easily pervious to moisture, air, and roots. In wooded areas layer is dark grayish brown to a depth of about 2 inches and has a high organic-matter content.
- 9 to 40 inches, dark-red moderately firm crumbly clay loam containing a few dark-gray manganese concretions; easily permeable to moisture and air and freely penetrated by roots; slightly to medium acid; much lower organic-matter content than in the overlying layer.
- 40 to 90 inches, red highly micaceous soft clay loam.
- 90 inches +, yellow or greenish-yellow micaceous sandy loam mixed with quartzite pebbles.

In depth, texture, color, and consistence the profile layers are remarkably uniform, as compared to those of other soil types, but minor variations do occur. In a few small areas where surface drainage is slow, the surface soil is nearly black. The darker color is apparently caused by an unusually high organic-matter content. Areas that border Altavista loam, undulating phase, or those with slower internal drainage than usual have a reddish-brown or brown subsoil. Most of the cleared soil has been slightly eroded, and a few areas are stony.

This loam is easy to work and conserve, and its productivity for crops commonly grown is good. It is generally less acid than are Fannin and Hayesville soils, ranging from medium to slightly acid in the surface soil and subsoil. It also has a better supply of available plant nutrients. The loose crumbly consistence throughout the soil profile permits easy penetration of roots into the parent material and free movement of air and moisture. The moisture-holding capacity is good.

Use and management.—Hiwassee loam, undulating phase, is good to very good for crops and pasture. About 80 percent is in cropland, 10 percent in permanent pasture and miscellaneous uses, and 10 percent in forest. The principal crops are corn, wheat, rye, and lespedeza. Crimson and red clovers are less commonly grown. The soil is well suited to snap beans, potatoes, and cabbage. A small part is used for sorghum, which when processed, averages 150 gallons of sirup an acre.

Crop rotations are used to some extent. The principal rotation is made up of corn followed by either wheat or rye seeded with lespedeza. The year following the harvest of the corn, the small-grain crop is harvested. The lespedeza remains on the land to improve the soil. The next year corn is planted or the lespedeza is allowed to reseed the land for use as pasture. In some rotations crimson clover is substituted for lespedeza and turned under for green manure, or red clover is substituted and used for hay.

In the corn-small grain-lespedeza rotation, corn is fertilized with 100 to 200 pounds an acre of a complete fertilizer, as 2-10-2 or 4-8-4, or with similar quantities of superphosphate, and wheat is fertilized with 100 pounds of superphosphate. Rye, when fertilized, receives the same fertilizer treatment as wheat. The legume crops generally are not fertilized, but the land on which they are grown receives 1 to 1½ tons an acre of ground limestone once in 5 or 6 years. Barn-yard manure, when available, is applied to cornland.

Under common management on this soil corn yields average 30 bushels an acre; wheat, 18; rye, 15; and lespedeza and red clover, each about 1½ tons of hay.

Hiwassee loam, eroded undulating phase (Hwr).—At various places on the Hiwassee Plateau this soil occupies areas of 2- to 7-percent slope on high terraces. It differs from the undulating phase in having lost a considerable part of its original surface soil through accelerated erosion. The remaining surface soil, a dark reddish-brown crumbly loam, averages 6 inches in thickness, as compared to about 9 inches for the undulating phase. In some patches the plow layer contains subsoil material of reddish-brown to brownish-red heavy loam; in others all the surface soil has been removed by erosion and the plow

layer consists of dark-red subsoil material. The subsoil and parent material resemble those of the undulating phase. Both external and internal drainage are medium. Workability and conservability are easy, and productivity is good.

Use and management.—This eroded undulating phase of Hiwassee loam is used largely for crops of corn, wheat, rye, and lespedeza. Crimson and red clovers and sorghum for sirup are grown on a small part. The soil is good to very good for crops and very good for pasture. It is well suited to the production of snap beans, potatoes, and cabbage.

With the management commonly practiced, corn yields average 28 bushels an acre; wheat, 16; rye, 14; lespedeza, 1½ tons of hay; red clover, 1 ton of hay; and sorghum 135 gallons of sirup.

Hiwassee loam, eroded rolling phase (Hwg).—Areas of this soil occur chiefly on high terraces bordering the Hiwassee River and its tributaries. They generally border areas of steeper Hayesville soil or areas of more gently sloping Hiwassee soil. This phase differs from the undulating phase mainly in having a thinner surface soil, stronger slopes, and a lower organic-matter content. The reddish-brown to brownish-red surface soil is 4 to 6 inches deep, depending on the extent of erosion and the quantity of subsoil material mixed in by plowing.

Considerable variation exists in the depth of the soil profile and in other characteristics. In a few places quartzite gravel underlies the profile at a depth of about 18 inches. Stony areas are indicated on the soil map by symbol. The relief is moderately sloping to strongly sloping. Slopes range from 7 to 15 percent but average about 12 percent. External drainage is medium to rapid and internal drainage is medium.

This soil is rather easily worked. The stronger slopes make the control of erosion more difficult than on Hiwassee loam, undulating phase, and most of the cultivated soil has been materially damaged by accelerated erosion. Productivity, however, is good.

Use and management.—Hiwassee loam, eroded rolling phase, is fair to good for crops and good for pasture. About 70 percent of its total area is used for crops and 15 percent for permanent pasture. Approximately 5 percent is lying idle, and 10 percent is forested, mainly with deciduous trees. The crops most commonly grown are corn, wheat, rye, and lespedeza. Crimson and red clovers are of less importance. Sorghum for sirup, snap beans, potatoes, and cabbage are grown to a small extent.

The soil-management practices are similar to those for Hiwassee loam, undulating phase, but crop yields are somewhat lower. Under common management corn yields average 25 bushels an acre; wheat, 14; rye, 13; lespedeza and red clover 1 ton of hay each; and sorghum, 120 gallons of sirup.

Hiwassee-Hayesville stony loams, eroded hilly phases (HHo).—This complex of stony Hiwassee and Hayesville soils has for the most part been moderately to severely eroded, but some places have been affected very little by erosion. The individual areas are too small and too intricately associated to be mapped separately. Profile characteristics vary considerably from place to place, and all grada-

tions in the profiles of Hiwassee and Hayesville soils do occur. Pebbles and larger waterworn rock fragments, mainly quartzite, are common on the surface, and in many places in the profiles, particularly in the profile of the Hiwassee soil. In most areas the soil consists of a shallow layer of Hiwassee soil material underlain by weathered granite-gneiss; but in some places the typical Hiwassee profile has developed. In places the typical Hayesville profile has formed, but in others the profile is poorly developed.

This complex has rapid external drainage and medium internal drainage. Relief is very strongly sloping and hilly, as slopes range from 15 to 30 percent. The areas occur as narrow strips bordering first bottoms along the Hiwassee River and tributary streams and most of them are less than 10 acres in size. Small areas of severely eroded phase, having a total extent of about 295 acres, are included. Tillage is difficult because of strong slopes, poor tilth conditions, and stoniness. Erosion is difficult to control.

Use and management.—About 10 percent of Hiwassee-Hayesville stony loams, eroded hilly phases, is under cultivation; 10 percent is permanent pasture; 30 percent is idle land; 20 percent is in shortleaf pine; and 30 percent is mainly in oak. The included severely eroded phases are 5 percent under cultivation, 5 percent in permanent pasture, 40 percent in idle land, and 50 percent in shortleaf pine.

This complex is very poor cropland and is best used for pasture. Crop yields are generally too low to permit profitable cultivation. The included severely eroded phases are best suited to forest. Pastures have a low carrying capacity under average conditions. Ordinarily, about 10 acres afford grazing for one cow, but with proper fertilizer and lime treatment the land would be well suited to bluegrass and white clover, and about 3 acres should provide grazing for one cow.

PORTERS SERIES

The members of the Porters series have a brown, yellowish-brown, or slightly grayish-brown surface soil moderately high in organic matter. The subsoil is a brown or yellowish-brown soft crumbly clay loam underlain by yellowish-brown loose crumbly but gritty clay loam. Weathered granite-gneiss rock is ordinarily at a depth of 20 to 60 inches. In a few places fine-textured schist, quartz mica schist, or more nearly basic metamorphic kinds of rock underlie the profile.

Porters soils usually occur on steep and very steep slopes at high elevations on mountains. In large part they are stony, and loose stones are on the surface and in the profile.

The units of this series are as follows:

Porters loam:	Porters-Balfour loams, hilly phases
Steep phase	Porters-Balfour clay loams, eroded hilly phases
Eroded steep phase	Porters-Balfour stony loams, hilly phases
Porters stony loam:	Porters-Balfour stony clay loams, eroded hilly phases
Steep phase	
Eroded steep phase	
Very steep phase	

Porters loam, steep phase (Plz).—This brown friable mellow soil occurs on mountains and has steep relief; gradients range from 30 to 60 percent. Its variable depth to bedrock ranges from 36 to 60 inches. It is associated with other Porters soils and other soils

occupying positions on mountains. External drainage is medium to rapid and internal drainage is medium.

Except in the more moist places, the original forest was classified as oak-chestnut. The forest now consists chiefly of oaks with a smaller number of other deciduous trees and coniferous trees, especially white pine and hemlock, at the higher elevations. Yellow-poplar, red maple, and ash are the common trees in the more moist places.

Profile characteristics in a forested area:

- 0 to 2 inches, dark grayish-brown fluffy loam; dark color is caused by a relatively large quantity of decomposed organic matter mixed with the mineral material.
- 2 to 7 inches, dark-brown to brown fluffy loam containing considerable grit; easily penetrated by moisture, air, and roots; medium to strongly acid.
- 7 to 28 inches, brown or yellowish-brown crumbly clay loam or heavy loam; low organic-matter content; easily penetrated by moisture, air, and roots; medium to strongly acid.
- 28 to 40 inches, yellowish-brown crumbly clay loam or loam containing many small angular and subangular quartz grains.
- 40 inches +, reddish weathered granite-gneiss rock; at a depth of 5 feet or more, unweathered rock.

In profile characteristics this soil is similar to Balfour loam, rolling phase, but it has stronger relief, slightly thinner surface soil, less well-developed subsoil, and more frequent variations in the depth of the profile.

This soil is moderately difficult to work and to conserve and is fairly productive. It contains a moderate quantity of organic matter, is probably fairly well supplied with essential plant nutrients, and absorbs and holds moisture fairly well.

Use and management.—Porters loam, steep phase, is now largely in forest. It is poor for crops and seems best suited to pasture. The steeper areas are most feasibly used for forest. The soil is poor for crops because of its steepness.

Porters loam, eroded steep phase (Plf).—From the steep phase this soil differs only in the surface layer, which has been altered by accelerated erosion to the extent that the texture generally is clay loam rather than loam. Slopes range from 30 to 60 percent. External drainage is rapid to very rapid and internal drainage is medium. The severely eroded condition of about 35 percent of the total area is indicated on the soil map by symbol. An example of the severe erosion is an area 1½ miles southwest of Lower Hightower Church. This phase is fairly easily worked and fairly productive but difficult to conserve.

Use and management.—All of Porters loam, eroded steep phase, has been cleared of forest and at some time used for pasture and cultivated crops. Steepness and erosion make it very poor cropland. As the soil has been materially damaged by erosion, it is now suited mainly to forest, although with proper management some parts could be used for pasture. About 80 percent is now in pines; the rest is idle land with a variable cover of broomsedge, blackberry, and other small wild plants.

Porters stony loam, steep phase (Psz).—This is the most extensive soil in the county. It occurs in large bodies on steep and very steep mountain slopes (30 to 60 percent or more). A large number of char-

acteristic angular rock fragments are strewn over the surface and embedded in the profile. Aside from the stoniness of its profile, this soil is more variable in profile development and shallower to bedrock (20 to 36 inches) than Porters loam, steep phase. External drainage is medium to rapid and internal drainage is medium. Nearly all of this soil was originally covered with oak-chestnut forest, but the present forest is largely oak.

Profile description of a forested area:

- 0 to 1 inch, dark grayish-brown fluffy loam containing a large quantity of well-decomposed organic matter and held together by numerous small roots, mold, and other organic material.
- 1 to 7 inches, brown or yellowish-brown fluffy loam containing small rock fragments; larger rock fragments up to boulder size are scattered over the surface; layer easily penetrated by moisture, air, and roots; medium to strongly acid.
- 7 to 24 inches, brown or yellowish-brown crumbly clay loam containing many granite-gneiss fragments that are more numerous in the lower part of the layer than in the upper; material low in organic-matter content and easily penetrated by moisture, air, and roots; medium to strongly acid.
- 24 inches +, bedrock consisting of granite-gneiss.

In many profiles the subsoil is only a few inches thick and granite-gneiss is reached at a depth of 20 inches or less. In other profiles the subsoil is well developed to a depth of 36 inches or more.

The soil is difficult to work, and in most places stoniness and steepness limit feasible use for forest. It is fairly easily conserved, fairly well supplied with organic matter, and moderate in content of essential plant nutrients.

Small areas of the steep phases of Hayesville and Rabun soils are included with this soil because their steep mountainous relief and limited agricultural use did not make it feasible to map them separately. About 350 acres of Porters stony clay loam, steep phase, also are mapped with this soil. Its heavier texture was caused by the removal of a part of the original loam surface soil by accelerated erosion. All the soil was once cleared land, but cultivation has been discontinued because the steep slopes hindered tillage and made control of erosion difficult. The present cover is largely a dense growth of shortleaf, pitch, or Virginia pines and broomsedge and blackberry. Management requirements are those for the production of forest rather than crops and pasture.

Use and management.—Porters stony loam, steep phase, is very poor for crops and poor to very poor for pasture. Nearly all of it is in forest, the use to which it is best suited.

Porters stony loam, eroded steep phase (PsF).—The 10- to 20-acre areas of this soil are at the sources of Scataway and Hightower Creeks, mostly near Sassafras Knob. These areas were once the same as those of Porters stony loam, steep phase, but one-half to three-fourths of the original surface soil was eroded away during cropping. In some places the plow layer is now rather heavy because subsoil material has been mixed with it. The stony slopes range from 30 to 60 percent. External drainage is rapid to very rapid but internal drainage is medium.

Steepness and stoniness make tillage difficult. The steep slopes are subject to further loss of material through rapid runoff, and the control of erosion is very difficult.

About 350 acres of Porters stony loam, severely eroded steep phase, are included with this soil. The surface soil of this inclusion is variable in thickness but averages only 3 inches. Considerable subsoil material is mixed with the plow layer, and in many places all the surface soil has been eroded and the brown or yellowish-brown crumbly clay loam subsoil is exposed.

Use and management.—Most of the eroded steep phase of Porters stony loam has been in crop use, but cropping has been discontinued in most areas because of difficulties involved in tilling the steep stony slopes and the lack of suitable methods for controlling erosion. The soil is poor for crops and very poor to poor for grazing. Nearly everywhere the soil is covered with broomsedge, dewberry and blackberry bushes, and scattered young shortleaf pines or is grown over with shortleaf pines. The generally unfavorable features for crops and pasture make forest the best use for this soil.

Porters stony loam, very steep phase (Psv).—This steepest phase of the Porters stony loam occurs in scattered areas on higher mountain slopes, mainly in the southwestern part of the county. The slope is 60 percent or more. The soil is shallower to bedrock in some places than the steep phase. External drainage is rapid to very rapid and internal drainage is medium.

Use and management.—Steepness and stoniness of this very steep phase of Porters stony loam make tillage extremely difficult. Conservability is difficult and productivity is poor. Practically all the land is in forest, its most feasible use. Although trees suitable for timber are grown, logging operations are made difficult by the very steep slopes.

Porters-Balfour loams, hilly phases (PB_H).—Widely scattered 10-to 20-acre areas of this complex occur throughout the mountainous country, mainly on lower slopes bordering areas of Hayesville soils. The individual areas of Porters and Balfour soils in the complex are so small and intricately associated that they cannot be feasibly separated on the soil map. Relief is hilly; slopes range from 15 to 40 percent but average about 22 percent. External drainage is medium to rapid and internal drainage is medium.

The Porters surface soil consists of dark-brown or brown friable mellow loam about 8 inches thick; that of the Balfour is brown friable gritty loam, also 8 inches thick. The subsoil of the Porters areas is brown or yellowish-brown crumbly clay loam or loam to a depth of about 28 inches, where it gives way to yellowish-brown crumbly clay loam or loam containing a large number of quartz grains. Bedrock of granite-gneiss is at a depth of 5 feet or more in Porters areas. The subsoil of the Balfour areas is brown or yellowish-brown moderately firm crumbly clay loam to a depth of about 32 inches, where it grades into yellowish-brown loose clay loam containing many small quartz grains. Bedrock of granite-gneiss is at a depth of 8 feet or more in the Balfour areas. Throughout the extent of this complex the Balfour soil has a better developed and deeper profile than the Porters. The degree of profile development is the main difference between the two.

The soils of the complex are moderately easily worked and conserved, and their productivity is good. The Porters soil is moderately well supplied with organic matter, but the Balfour has a moderate to fairly

low supply. Both are fairly well supplied with essential plant nutrients. Moisture, air, and roots easily penetrate the soils; and the water-holding capacity is good. Moisture relations are favorable for plant growth.

Use and management.—Porters-Balfour loams, hilly phases, is better suited to pasture than to crops and makes good pasture land if properly managed. About 85 percent of the land is in forest. The original forest consisted mainly of oak and chestnut, with yellow-poplar, ash, red maple, white oak, and Northern red oak in the more moist places. Oaks are most common in the present forest, but among them are many other deciduous trees and pines. The pine is mainly shortleaf. A relatively small total area has been cleared for agricultural use, and nearly all of this is used for pasture. So far as internal soil characteristics are concerned, most of the complex is suited to bluegrass and white clover, but about 40 percent of the total area is inaccessible to pasture use. The carrying capacity of woodland pasture is low, but 2 acres of well-managed bluegrass pasture on cleared land can carry one cow.

Porters-Balfour clay loams, eroded hilly phases (PBO).—This complex is on lower slopes of mountains in the southern part of the county and differs from Porters-Balfour loams, hilly phases, only in having a heavier textured surface soil of clay loam. Originally, the surface texture was loam; the present clay loam texture is the result of accelerated erosion. The relief is hilly; slopes range from 15 to 40 percent. External drainage is rapid to very rapid and internal drainage is medium. About 20 percent of the total area, indicated on the soil map by symbol, has been severely eroded. Workability is good; conservability and productivity are fair. The supply of organic matter is relatively low, although the content of essential plant nutrients is fair.

Use and management.—Porters-Balfour clay loams, eroded hilly phases, is poor for crops but fair to good for pasture. The control of erosion is one of the main problems in management. Approximately 70 percent of the land is now in shortleaf, pitch, or Virginia pines; 25 percent is lying idle; and 5 percent is in pasture and under cultivation. Probably 50 percent is too distant from other areas of land suitable for pasture or cultivated crops to be used as pasture land. So far as soil characteristics are concerned, this complex is well suited to bluegrass, white clover, and other pasture plants. More care, however, is required to establish pasture than on Porters-Balfour loams, hilly phases, because of erosion and the low supply of organic matter in the surface soil. Where used as range land, this complex has a low carrying capacity, but under proper management its carrying capacity would be one cow to about 2½ acres.

Porters-Balfour stony loams, hilly phases (PTH).—This complex, confined in development to tops and lower slopes of mountains, is practically all under forest cover. It is characterized by the presence on and through the soil of many angular rock fragments, some as large as 6 inches in diameter. Stoniness is the main feature distinguishing it from Porters-Balfour loams, hilly phases. The relief is hilly (15 to 40 percent). External drainage is medium to rapid and internal

drainage is medium. This complex is only fairly easily worked but it is easily conserved and moderately productive.

Use and management.—Some areas of Porters-Balfour stony loams, hilly phases, would make fair pasture land, but the best use for many of them is forest. Strong slopes and stoniness make the land poor for crops. About 22 acres 1 mile southwest of Wood Grove has been cleared for a short time and is used for pasture and crops. Since being cleared, it has become slightly eroded.

Forest of deciduous trees (mainly oaks) mixed with white pine (white pine composes somewhat more than 15 percent of the mixture) is on higher lying areas. Yellow-poplar is the most common tree on the lower lying areas.

Porters-Balfour stony clay loams, eroded hilly phases (Pco).—This complex differs from Porters-Balfour stony loams, hilly phases, mainly in the surface soil, which has been altered by accelerated erosion to the extent that about one-half to three-fourths or more of the original soil layer has been removed. Where erosion has left very little of the original surface soil, much subsoil material has been mixed with the remaining surface soil, and consequently the plow layer is a clay loam and somewhat heavier than the less eroded soil. The relief is hilly, with slopes of 15 to 40 percent. External drainage is rapid to very rapid and internal drainage is medium. Workability is fairly easy on the less steep slopes but difficult on the steeper ones. Erosion has caused the loss of both mineral and organic matter, and its control is an important management problem.

Use and management.—Porters-Balfour stony clay loams, eroded hilly phases, is poor for crops and fair for pasture, and in many areas is best used for forest. All of the land was once cleared and used for crops and pasture, but about 80 percent has been allowed to grow over with shortleaf pine. Most of the open land is idle and thickly grown with broomsedge, blackberry, and other small wild plants.

RABUN SERIES

The soils of the Rabun series have a dark-red friable clay loam surface soil and a similarly colored but heavier subsoil. The parent material is light-red crumbly clay loam, grading into greenish and purplish-red weathered hornblende gneiss at 45 to 60 inches. The profile generally is underlain at about 10 feet by hornblende gneiss interbedded in places with biotite schist and granite-gneiss.

Compared with Hayesville soils, the Rabun have a deeper red color and are more crumbly and heavier throughout the profile. They are generally deeper to bedrock and have developed over rock of more basic character. They are less damaged by erosion, but their surface soil in virgin areas is clay loam or stony clay loam rather than loam or stony loam as in the Hayesville soils. The Rabun soils are a little better suited both to grains and legumes than the Hayesville but they must be worked under a narrower range of moisture conditions. They are developed on steeper slopes than those of the Hayesville.

The soils of this series are the steep, eroded steep, and eroded rolling phases of Rabun stony clay loam.

Rabun stony clay loam, steep phase (Rcz).—This steep (30- to 60-percent slopes) soil has formed on mountains from weathered

dark-colored rocks and is characterized by a brownish-red friable crumbly comparatively deep profile. All of it is on the east slope of Long Ridge. External drainage is rapid but internal drainage is medium.

Profile characteristics in a forested area:

- 0 to 2 inches, dark-brown or dark grayish-brown fluffy silt loam, high in content of well-decomposed organic matter; numerous small roots.
- 2 to 8 inches, brownish-red very crumbly clay loam, smooth and plastic when moist; layer lower in organic-matter content than the one overlying and easily penetrated by moisture, air, and roots; medium acid.
- 8 to 15 inches, brownish-red crumbly clay loam slightly heavier than the overlying layer and easily penetrated by moisture, air, and roots; medium acid.
- 15 to 34 inches, red soft clay loam that readily breaks down to small crumb-like aggregates easily penetrated by moisture, air, and roots; medium acid.
- 34 to 52 inches, light-red smooth clay loam slightly lighter than the clay loam of the overlying layer.
- 52 inches +, parent rock consisting of greenish hornblende gneiss.

The layers of the soil profile vary slightly in thickness from place to place. On the surface and mixed throughout are numerous angular partly weathered fragments of hornblende gneiss, up to 6 inches or somewhat more in diameter, that make the soil stony.

Use and management.—Rabun stony clay loam, steep phase, is forested, and none has ever been cleared for agricultural use. The forest consists of oaks and other deciduous trees, and a few shortleaf pine. Steepness and stoniness make this soil difficult to work and conserve. It is fairly well supplied with essential plant nutrients, and its water-holding capacity is fairly good. In most places it is too steep and stony for feasible use as cropland, but the less steep areas are fairly well suited to pasture if proper management is practiced. The steepest parts are best for forest.

Rabun stony clay loam, eroded steep phase (RCE).—This phase is composed of areas of Rabun stony clay loam that have been materially damaged by accelerated erosion. About one-half to three-fourths of the original surface soil has been eroded away. The plow layer now consists of brownish-red friable clay loam that contains subsoil material in most areas. Slopes are steep (30 to 60 percent). External drainage is rapid to very rapid and internal drainage is medium. Practically all this soil is on the east slope of Long Ridge. Probably 16 percent of it has been severely eroded and has lost all or nearly all the original surface soil. These areas are shown on the soil map by symbol.

Included with this soil are 230 acres of soil similar to Rabun stony clay loam in profile characteristics and stoniness but milder in relief (15 to 30 percent). This included soil occurs mostly on the east slope of Long Ridge about 2 miles southwest of Hiwassee and near Lower Bell School northeast of Hiwassee. Under forest cover the surface layer to a depth of about 2 inches is dark-brown or dark grayish-brown fluffy silt loam containing a large quantity of decayed leaves, twigs, and other vegetable matter; and underlying to a depth of about 8 inches is brownish-red crumbly clay loam containing very little organic matter. The brownish-red friable clay loam subsoil becomes red crumbly clay loam at a depth of about 15 inches and grades into

light-red smooth clay loam soil material at a depth of about 34 inches. Rock fragments up to 6 inches or more in diameter are on the surface and mixed throughout the profile.

Another inclusion, Clifton clay loam, occupies an area 2½ miles southwest of Lower Bell School, where areas of Rabun soil merge with areas of Hayesville soil. This soil has formed from weathered material composed of a mixture of basic and acidic rocks—granite-gneiss, biotite schist, and probably hornblende schist or gneiss. It is intermediate between Rabun and Hayesville soils in color and other profile characteristics.

Use and management.—Steep slopes, stoniness, and eroded condition make Rabun stony clay loam, eroded steep phase, difficult to work. Because it is subject to further erosion, the control of runoff is an important management problem. Organic-matter content is low and the supply of essential plant nutrients is poor. Productivity for crops and pasture is fair. Although steepness and erosion render the soil poorly suited to crop use, some less steep and less severely eroded areas are fairly suitable for cropping. The soil is fair for pasture, but the steeper and more severely eroded areas probably are best suited to forest.

All of this phase has at one time been under cultivation. Approximately 40 percent is now used for crops and 5 percent for pasture; some 35 percent is idle land in broomsedge, smilax, dewberry, blackberry, and scattered young shortleaf pines; and 20 percent has been allowed to grow up in shortleaf pine.

Corn, the principal crop, is grown continuously or alternated with rye or wheat. It is fertilized with 100 to 150 pounds an acre of superphosphate, or 4-8-4, and yields an average of 20 bushels an acre. Rye and wheat average 11 bushels each an acre when fertilized, but ordinarily they are not fertilized and yield an average of 6 bushels each.

Of the 230-acre area of included soil, 25 percent is under cultivation and 5 percent is in permanent pasture. Approximately 10 percent is idle land covered with shortleaf pine, and 60 percent is in forest of oak and other deciduous trees. The land in forest has been affected very little by erosion, but some of the cleared land has been moderately eroded and a fairly large area has been severely eroded. The eroded areas are indicated on the soil map by symbol.

Owing to the difficulty of tillage and erosion control, the 230-acre area of included soil is more suitable for pasture than for clean-cultivated crops, although it could be a good soil for hay crops. Under common management corn is fertilized in the row with 150 pounds an acre of 4-8-4 or superphosphate and averages 20 bushels an acre. Rye or wheat, fertilized only with stable manure and grown without the benefit of legumes, yield an average of 6 bushels an acre. The carrying capacity of pasture ordinarily is about 5 acres to one cow, but with suitable treatment it should be 2 acres to one cow. Lime and phosphate applications should produce 1½ to 2 tons of red clover hay and the same of lespedeza hay.

Rabun stony clay loam, eroded rolling phase (Rcg).—From the steep phase of Rabun stony clay loam, this soil differs in having gentler relief, in being eroded in most places, and in having in some places a slightly deeper profile over bedrock. The slopes range from 7 to 15

percent, compared to 30 to 60 percent for Rabun stony clay loam, steep phase. Most of this land has been cleared for cultivation and has lost about one-half to three-fourths of the original surface soil, whereas the steep phase has remained in forest and is practically uneroded. The soil is on top of ridges where the gradient is about 10 percent, and adjoins areas of the steep phase.

External drainage is rapid, and the control of erosion is one of the main problems in management. Owing to stoniness, poor tilth conditions, and strong slopes, tillage is somewhat difficult. The supply of organic matter is low, and the content of essential plant nutrients is fairly low.

Southwest of Hiwassee School this soil includes areas of Rabun stony clay loam with slopes of 2 to 7 percent and averaging 5 percent.

Use and management.—The eroded rolling phase of Rabun stony clay loam is used mainly as cropland. It is fairly productive as cropland and also good for pasture. Corn and rye, the principal crops, are usually grown alternately. Corn commonly receives 100 to 150 pounds of superphosphate or 4-8-4 an acre and yields 20 to 40 bushels an acre, or an average of 25 bushels. When not fertilized, rye produces 8 to 15 bushels an acre, or an average of 13 bushels. If corn is grown in a rotation with rye and a legume and is given heavier applications of fertilizer than usual, it should produce as much as 50 bushels. With adequate fertilization, rye should produce as much as 20 bushels. Red clover yields $1\frac{1}{4}$ to $2\frac{1}{2}$ tons of hay an acre; lespedeza, $1\frac{1}{3}$ to almost 2 tons, depending largely on management. Crimson clover is grown with fair to good success.

Under similar methods of management, the included less steeply sloping areas of Rabun stony clay loam are less susceptible to erosion than this phase and give crop yields about 10 percent higher.

ROUGH GULLIED LAND (HAYESVILLE SOIL MATERIAL)

Rough gullied land (Hayesville soil material) (RgH) is made up of areas of Hayesville soil in which accelerated erosion has removed all the surface soil and subsoil from at least half of each area. The parent material of soft decayed rock is exposed. Areas too small to separate are shown by appropriate symbols.

Use and management.—Rough gullied land (Hayesville soil material) is badly gullied and tillage operations and the control of erosion are therefore very difficult. Productivity is very poor; the most feasible use is for forest.

ROUGH STONY LAND (PORTERS SOIL MATERIAL)

Rough stony land (Porters soil material) (RsP) is in the mountains on very steep slopes (60 percent or more). Many large boulders and smaller rock fragments are on the surface and mixed throughout the soil mass. These are predominantly granite-gneiss, but some are quartz schist, mica schist, quartzite, or hornblende gneiss. Outcrops of bedrock appear here and there. Nearly everywhere the soil consists of Porters soil material, in most places a grayish-brown or brown loam or clay loam extending to a depth of less than 20 inches.

Use and management.—Owing to the very steep slopes, Rough stony land (Porters soil material) is very difficult to work and to conserve.

Practically all of it is forested. The forest is inferior to that on Porters stony loam, steep phase, although good timber grows in some places. The forest stand is composed of small oaks, white pine, hemlock, and a mixture of other trees. The undergrowth is mainly rhododendron and mountain-laurel. In nearly all places this land is unsuitable for cropping and grazing; it is most feasibly used for forest.

SPILO SERIES

The soils of the Spilo series are in first bottoms near streams and are associated with soils of the Chewacla series. They differ from the Chewacla soils in having slower drainage and in being more compact, particularly in the subsoil. They are swampy in places, and unless artificially drained, are too wet for tilled crops. The supply of organic matter is low.

Spilo soils have light-gray to medium-gray compact surface soil 7 to 9 inches thick and light-gray, streaked or mottled with yellowish brown, tough slowly pervious subsoil 12 to 22 inches thick. Underlying the subsoil is a bluish-gray tough clay layer 18 inches or more thick that may be splotched in places with yellow or rust brown. The units of this series are Spilo silty clay loam; Spilo silty clay loam, better drained phase; and Spilo-Chewacla silt loams.

Spilo silty clay loam (Ss).—This loam is associated with Chewacla silt loam in first bottoms near streams in the northern part of the county but is more poorly drained. Where typically developed, it has a light-gray to medium-gray heavy surface soil and a streaked or mottled tough clay subsoil that permits only slow water movement through the soil. Relief is level or nearly level, and external and internal drainage are very slow. Except where artificially drained, the soil is waterlogged most of the time and the natural vegetation consists of sedges and other water-tolerant plants.

Profile description:

- 0 to 8 inches, light-gray or medium-gray compact silty clay loam; strongly acid.
- 8 to 25 inches, light-gray, streaked or mottled with yellowish-brown, tough massive slowly pervious clay; strongly acid.
- 25 inches +, bluish-gray tough somewhat plastic massive clay; underlain in some places by angular quartz fragments at a depth of 48 inches or more; strongly acid.

The layers vary somewhat in thickness from place to place. Much variation exists in the color of the surface soil, depending to a large extent on the content of organic matter. In places, to a depth of 3 or 4 inches, the surface soil is nearly black in contrast to the light gray or medium gray in areas where the supply of organic matter is lower.

Although the soil is level or nearly level, its heavy surface layer makes it difficult to work. It can be conserved very easily but its inherent fertility is low. Drained areas can be worked under a very limited range of moisture conditions. The soil remains soggy for some time after adjoining soils are dry enough to be tilled, and it is slow to warm in spring. More power is required to work it than any of the associated soils because of the heavier texture of the surface soil. The large quantity of mica flakes mixed through the profile

and the tight clay subsoil have caused poor porosity and generally unfavorable conditions for the growth of plants.

Use and management.—Spilo silty clay loam is inferior for crop production but fair for pasture if properly managed. Where drainage is favorable and the soil has been limed, small areas are used with fair results for corn, sorghum, oats, and other crops. A large part is used as pasture, but some areas are virtual wasteland. Ordinarily about 5 acres afford grazing for one cow. Artificially drained areas fertilized with 500 pounds of superphosphate and 2 tons of ground limestone an acre are well suited to bluegrass and white clover, and where a stand of this vegetation is well established, the carrying capacity is one cow to about 2 acres.

Spilo silty clay loam, better drained phase (SSB).—Although situated in first bottoms near streams, this soil has slightly better natural drainage than Spilo silty clay loam. Some artificial drainage by shallow open ditches or by covered ditches filled with pine poles and stones supplements the natural drainage. Profile characteristics are similar to those of Spilo silty clay loam. Relief is level or nearly level; the gradient is less than 2 percent. External drainage is very slow, but internal drainage is not so slow as that of Spilo silty clay loam.

Practically all of this soil is cleared and in agricultural use. It is fairly easily worked and very easily conserved, but good tilth is difficult to obtain because of the heavy surface soil. The supply of organic matter and the natural fertility are low.

Use and management.—Where management is good, Spilo silty clay loam, better drained phase, makes fair cropland and fair to good pasture land. About 60 percent of the soil is in corn, 20 percent in rye, and the rest is mainly in lespedeza and pasture. Lime has been applied to about half the total area.

Corn grown on unlimed and occasionally fertilized areas of this soil produces an average yield of about 13 bushels of grain an acre; rye, about 8 bushels; and lespedeza about $\frac{3}{4}$ ton of hay. If 150 to 200 pounds an acre of 4-8-4 or superphosphate is applied, corn averages 18 bushels an acre; rye, 10 bushels; and lespedeza, 1 ton of hay. If a systematic crop rotation including a legume is followed and the soil is limed and heavily fertilized, crops do much better. Under this treatment corn averages 33 bushels an acre; rye, 13 bushels; and lespedeza, 1½ tons of hay.

Spilo-Chewacla silt loams (SC).—This complex consists of an intricate mixture of small areas, mostly less than an acre in size, of Spilo silt loam, Chewacla silt loam, and Tate and Altavista soils. Spilo silt loam, the predominant soil of the complex, is characterized by a light-gray compact silt loam surface soil about 8 inches thick and a light-gray or mottled light-gray and yellowish-brown tough almost impervious clay subsoil. This complex is in first bottoms, mainly along Wood Creek in the northwestern part of the county. The surface is level or nearly level, and external and internal drainage are slow to very slow. Although there is much variation in the natural drainage of each soil area, the complex, as a whole, is imperfectly drained.

The presence of old stream channels makes cultivation in most places impracticable. Conservation is easy but good tilth is somewhat difficult to maintain. Productivity is fair for hay, forage, and pasture. The supply of organic matter is low in the Spilo, Tate, and Altavista areas and moderately high in the Chewacla. The content of essential plant nutrients is probably low to moderately high.

Use and management.—Spilo-Chewacla silt loams make very poor to poor cropland but fair to good pasture land; it is best suited to pasture, hay, and forage. About 25 percent is in forest of deciduous trees. Nearly all the rest is used for hay crops and permanent pasture of lespedeza and native grasses mixed. Ordinarily hay yields average about 1½ tons an acre; the yield is considerably increased if lime is applied.

Management requirements for the production of permanent pasture include liming, fertilizing with superphosphate, and the use of properly selected pasture mixtures.

STATE SERIES

The soil of the State series—State silt loam, undulating phase—is on lower stream terraces than soils of the Hiwassee series. It differs from the Hiwassee soils mainly in the color of its surface soil and subsoil and in having a more open friable consistence throughout the subsoil. The 8- to 12-inch loose fluffy surface soil is very dark grayish brown or brown. The 15- to 32-inch brown to yellowish brown subsoil is underlain by light-brown sandy clay or gritty light clay loam containing mica flakes. At a variable depth this layer is underlain by coarse sand or gravel, mainly quartz. In contrast, the Hiwassee soils have a dark-brown to red surface soil and moderately firm darkened subsoil. State silt loam, undulating phase, is associated largely with soils of the Transylvania series.

State silt loam, undulating phase (STU).—This brown mellow well-drained soil occurs near the headwaters of Fodder Creek. Because of its inherently high fertility, most of it is in agricultural use. It is especially well suited to general farm and truck crops, as potatoes, cabbage, lettuce, spinach, and carrots. The relief is gently sloping, the gradient being less than 5 and mostly about 3 percent. External drainage is very slow to medium and internal drainage is medium. The soil is associated with Transylvania silt loam and Toxaway silt loam in first bottoms. Its position is only a few feet higher than the adjoining first bottoms. The inherent fertility is higher than for Hiwassee or Altavista soils and the surface soil has a higher organic-matter content.

Profile description:

- 0 to 10 inches, dark grayish-brown loose fluffy silt loam notably permeable and strongly acid.
- 10 to 15 inches, dark-brown crumbly friable heavy silt loam; much less organic matter than in overlying layer but more than in underlying layer; freely penetrated by moisture, air, and roots; strongly acid.
- 15 to 36 inches, brown soft crumbly clay loam; when very moist easily pressed into soft smooth ribbons; sufficiently porous to permit free movement of moisture and air and easy penetration by roots; strongly acid.
- 36 to 72 inches, light-brown micaceous sandy clay or gritty light clay loam.
- 72 inches +, coarse sand or gravel, mainly quartz.

All profile layers show slight variations in thickness. The thickness of the surface layer is somewhat greater than that of Altavista loam, undulating phase, on comparable relief.

This phase contrasts with Hiwassee loam, undulating phase, on high terraces in having a dark grayish-brown rather than a reddish-brown surface soil and a brown rather than reddish-brown subsoil. It contrasts with Altavista loam, undulating phase, on low terraces, which has a grayish-yellow surface soil and a yellow or slightly brownish-yellow subsoil. It is younger and has a higher organic-matter content in the surface soil than the undulating phases of Altavista or Hiwassee loams.

This soil is very easily worked because of nearly level to gentle relief, friable mellow surface soil, and absence of stones. The soil material and supply of plant nutrients can be easily conserved by a few intensive management practices. Organic-matter content is good; the plant nutrient supply is fairly high; and the moisture-holding capacity is good.

Use and management.—Owing to favorable external and internal features, State silt loam, undulating phase, is good to very good cropland and very good pasture land. Nearly all of it is used for field crops, truck crops, and pasture. About 50 percent is planted to corn, 5 percent to wheat, and 10 percent to rye for grain. Approximately 10 percent is used for snap beans, 5 percent for cabbage, 5 percent for potatoes, 10 percent for permanent pasture, and 5 percent for miscellaneous uses. Fertilization and crop rotation are practically the same as for Congaree fine sandy loam where similar crops are grown. Most areas, however, are rarely damaged by flooding, and as the soil lies higher than the Congaree soil, it is better suited to wheat.

Corn yields average 25 to 50 bushels an acre. Wheat yields average 18 to 25 bushels under careful management. Potatoes fertilized with 800 to 1,600 pounds of 3-9-5 yield 125 to 275 bushels an acre; cabbage fertilized with 1,000 to 1,500 pounds of 3-9-5 produces 10 to 21 tons an acre; and snap beans fertilized with 300 to 600 pounds of 4-8-4 average 150 bushels an acre.

STONY COLLUVIUM (PORTERS AND HAYESVILLE SOIL MATERIALS)

Stony colluvium (Porters and Hayesville soil materials) (ScP) consists of a mass of stone mixed with a small quantity of soil material washed mainly from Porters and Hayesville soils. The stones are quartzite or granite-gneiss fragments, and the soil is dark-gray or grayish-brown loam or clay loam containing a moderately large quantity of organic matter. It is on foot slopes and in first bottoms. The surface is level to strongly sloping; slopes range up to 15 percent.

Use and management.—The extreme stoniness of this land prohibits its use for cultivated crops. Approximately 30 percent is in permanent pasture, and the rest is in oak and other deciduous trees. The less stony areas are suitable for bluegrass and white clover pasture but at least half of the land is too far from farmsteads to be used for any purpose other than for forest. Areas used for permanent pasture have a carrying capacity of one cow to 3 to 10 acres, depending on the degree of stoniness, the kind and quality of the pasture plants, and the management practiced.

TALLADEGA SERIES

The Talladega series is composed of red highly micaceous soils relatively shallow to bedrock. The soils have very little subsoil. In many places there is none at all and the surface soil grades into the parent material. Weathered micaceous schist rock is generally reached within a depth of 20 inches and rarely at a greater depth than 36 inches. The surface soil is reddish brown and the subsoil and parent material are red. Relief is steep (30 to 60 percent).

Talladega soils are related to the Fannin soils but are steeper, have a somewhat shallower profile, and are more micaceous. The Talladega soils dry more readily than Fannin soils of similar slopes because they are shallow over bedrock. The members of this series are Talladega loam, steep phase, and Talladega clay loam, severely eroded steep phase.

Talladega loam, steep phase (Tgz).—This soil occupies 30- to 60-percent slopes on lower mountain slopes near Young Harris and in the northwestern part of the county. It is comparatively shallow to bedrock, highly micaceous, and has a slick greasy feel. The weathered micaceous schist rock from which it has formed has contributed many mica flakes to the profile. External drainage is medium to very rapid and internal drainage is medium. Most of this soil is in forest, having never been cleared or placed under cultivation.

Profile characteristics in a virgin area:

- 0 to 2 inches, dark grayish-brown or dark-brown friable mellow loam; moderately high organic-matter content.
- 2 to 10 inches, reddish-brown loose friable mellow loam; medium to very strongly acid.
- 10 to 28 inches, red or yellowish-red friable highly micaceous clay loam; medium to very strongly acid.
- 28 inches +, red weathered micaceous schist rock.

In places weathered schist rock is at much less depth than this profile indicates; in many others it comes to the surface. In general, the subsoil is less well developed than in Fannin loam, although in places a similar red micaceous subsoil may occur. The variable profile development is due to the steepness of the relief.

Steepness, shallowness, and other unfavorable features make tillage operations difficult on this phase. The soil is very difficult to conserve. It has a comparatively low content of available plant nutrients, and the supply of organic matter is lower than in some of the other soils of the county. The loose mellow surface soil and friable crumbly lower layers permit easy penetration by roots. The moisture-holding capacity is low. In cleared areas rain water runs off quickly and very little of it is absorbed.

Use and management.—The forest that formerly covered Talladega loam, steep phase, included various oaks and chestnut, but nearly all the chestnut trees have died from blight. The present forest consists of white, red, and chestnut oaks; various other deciduous trees; and a few shortleaf pines. The soil is most feasibly used for forest. Because of unfavorable external and internal features, it is very poor cropland and very poor to poor for pasture.

Talladega clay loam, severely eroded steep phase (TCP).—This soil consists of severely eroded areas that were formerly Talladega loam, steep phase. All the original oak-chestnut forest has been removed, and the soil is now used for cultivated crops. Owing to the steep slopes (30 to 60 percent), sheet erosion has been very difficult to control and in cultivated areas a considerable part of the original surface soil has been removed. As a result of tillage the plow layer has a clay loam texture caused by the mixture of subsoil materials with the shallow surface layer. Over at least 50 percent of the soil, little of the original surface soil remains; the top layer now consists of red highly micaceous clay loam subsoil material. In many places 6- to 12-inch gullies have formed less than 3 feet apart. External drainage is rapid to very rapid and internal drainage is medium. This soil is mainly in the vicinity of Young Harris. Only a small part is moderately eroded and still retains a fairly large part of the original surface soil.

This soil is very difficult to work and to conserve, and its productivity is very poor. The steep slopes, aside from other unfavorable features, as eroded condition and shallow depth to bedrock, preclude the feasible use of the soil over extended periods for any purpose except forest.

About 142 acres of severely eroded Talladega clay loam with hilly relief (15 to 30 percent) is included with this phase. The red gritty clay loam subsoil material of this included area is exposed; rills and shallow gullies are numerous; and large quantities of platy fragments of weathered mica schist are scattered over the surface and mixed through the soil. The inclusion occurs in small areas in association with other Talladega soils and Fannin soils occupying positions on the tops of ridges. Most of these included areas are near Young Harris and in the northwestern part of the county.

Use and management.—An estimated 50 percent of the severely eroded steep phase of Talladega clay loam is lying idle; 40 percent is in shortleaf pine; 5 percent is in pasture; and 5 percent is under cultivation. The crop yields generally are low; for example, those of corn are rarely more than 5 bushels an acre. About 60 percent of the included soil is in shortleaf pine, 30 percent in idle land, 5 percent in pasture, and 5 percent under cultivation. Corn, the main crop, averages 5 bushels an acre. Although some areas could be profitably planted to lespedeza, sericea lespedeza, or kudzu, most areas are so severely damaged by erosion that they are best used for forest.

TATE SERIES

Soils of the Tate series are somewhat similar to those of the Tusquiee in profile characteristics. They are on foot slopes and have formed of outwash from the immediate slopes occupied chiefly by soils of the Fannin, Talladega, and Hayesville series of the intermountain uplands. Tate soils are very gently sloping to moderately sloping.

The 10- to 15-inch surface layer of the Tate soils is red or reddish-brown crumbly silt loam. The 20- to 30-inch subsoil is red to yellow crumbly moderately compact heavy clay loam and it is underlain by either residual or alluvial material. The units of this series are the

undulating and eroded rolling phases of Tate silt loam and Tate-Chewacla silt loams.

Tate silt loam, undulating phase (TAU).—This phase is on lower slopes in the intermountain uplands and on stream terraces. It is distributed in small areas on the Hiwassee Plateau. The surface soil has formed from red overwash material from Fannin, Talladega, and Hayesville soils. It occupies slopes that range from 2 to 7 percent but average 4 percent. External drainage is slow to medium and internal drainage is medium.

Profile characteristics in a cultivated field:

- 0 to 12 inches, red to reddish-brown crumbly heavy silt loam or loam; low organic-matter content; medium to strongly acid.
- 12 to 48 inches, red crumbly clay loam, but in some places yellow heavy moderately compact clay loam; medium to strongly acid.
- 48 inches +, weathered micaceous schist or granite-gneiss, or friable alluvial material.

The layers of the profile vary considerably in color and texture. The thickness of the upper layer is extremely variable, ranging from 10 to 24 inches. Where the overwash is deposited on Fannin and Hayesville soils, the 35- to 40-inch subsoil is red crumbly clay loam underlain by red lighter clay loam grading at a depth of 48 to 72 inches into weathered schist or gneiss rock. If the buried soil is Hiwassee loam, the subsoil is a more porous crumbly red clay loam; but if the underlying soil is Altavista, the subsoil is yellow moderately compact heavy clay loam. In places where the overwash has come from severely eroded soils, the surface layer is red dense clay loam.

The soil is easy to work and very easy to conserve. It is fairly well supplied with essential plant nutrients and has good productivity. Moisture relations are favorable to plant growth, but the range of moisture conditions for cultivation is narrower than in many of the soils of the county. Root penetration is easy in the subsoil or where the surface soil is light silt loam or loam, but is somewhat difficult where the subsoil or surface soil consists of heavy clay loam.

Use and management.—Owing to its generally favorable external and internal features, Tate silt loam, undulating phase, is fair to good for crops and good to very good for pasture. At least 80 percent is under cultivation; 15 percent is in permanent pasture; and the rest is lying idle. Corn is the principal crop, but sweet sorghum grown for sirup is the most important cash crop.

Corn is followed by corn on many fields for several years, and little or no fertilizer is used in its production. Under this management yields average 15 bushels an acre. Some farmers seed cowpeas in the corn before its last cultivation. They harvest the mature peas and the pea vines are turned under the following spring to improve the soil. Where the rotation is made up of corn, rye, and lespedeza or crimson clover, corn receives 200 pounds of 4-8-4 an acre, and rye, 150 pounds of superphosphate. Under this management, corn averages about 23 bushels an acre; rye, 13 bushels; and lespedeza 1 ton of hay. Sorghum for sirup is substituted for corn in some rotations or alternated with corn where no definite rotation is followed. Sorghum is fertilized with 150 to 200 pounds of superphosphate an acre and yields 75 to 150 gallons of sirup an acre.

Permanent pasture has a carrying capacity of one cow to about 4 acres when it is not fertilized or limed. With proper management, pasture of well-established bluegrass and white clover should have a carrying capacity of one cow to about 2½ acres.

Tate silt loam, eroded rolling phase (TAG).—The slopes of this phase are stronger (7 to 15 percent) and the surface soil is slightly heavier than in the undulating phase. Erosion has been active. The soil is for the most part moderately eroded but in places is only slightly eroded. External drainage is medium to rapid and internal drainage is medium. The soil is in small areas on lower slopes. It borders areas of Hayesville and Fannin soils from which its material is derived. Practically all of it is cleared and in agricultural use. It is easily worked and conserved and has good productivity.

Use and management.—Tate silt loam, eroded rolling phase, is fair to good cropland and good pasture land. It is most extensively used as cropland; and about 80 percent is planted, principally to corn, rye, and lespedeza. A small part is in cowpeas and crimson clover. About 15 percent is in permanent pasture, and 5 percent is lying idle. Under similar management yields are about 10 percent lower than on the undulating phase.

Tate-Chewacla silt loams (TC).—This complex is derived from soil materials recently washed from red soils on the uplands and deposited on first bottoms. It is made up of intricately mixed areas of Tate and Chewacla soils too small to be shown separately on the soil map that are altered in places by a layer of recent overwash. Most areas are in first bottoms along nearly every stream in the Hiwassee Plateau, but they are rarely more than 10 acres in size. The relief is level to nearly level. External drainage is slow to very slow and internal drainage is medium to very slow. Many areas are subject to flooding for brief periods and a few are in a semiswampy condition much of the year. The vegetation in the semiswampy places consists of water sedges and alders.

In typical areas the uppermost layer is about 12 inches thick and consists of red loose silt loam low in organic matter. Much variation occurs. In some places it has a yellowish-brown or reddish-brown color, a sandy loam and loam to clay loam texture, and a 8- to 24-inch thickness. Beneath this layer is grayish-brown loose fluffy micaceous silt loam, grading at a depth of 30 to 36 inches into mottled gray and grayish-brown fairly compact micaceous silt loam. In some areas the grayish-brown layer is absent, and the red uppermost layer is directly underlain by mottled gray silt loam or by dark-gray silt loam of high organic-matter content. In a few areas the upper layer is underlain by light-gray dense clay similar to that underlying the uppermost layer of Spilo silty clay loam.

The soils of this complex range from medium to strongly acid but are generally medium acid where the underlying material contains a large quantity of organic matter. They are sufficiently loose and porous to afford easy penetration by roots and free movement of air and water. Although most areas have adequate natural drainage for the production of the crops ordinarily grown, the semiswampy areas require artificial draining for crop production. The complex is easy to work and very easy to conserve.

Use and management.—About 80 percent of Tate-Chewacla silt loams is under cultivation, 15 percent is in permanent pasture, and 5 percent is lying idle or is in forest and other uses. The land is moderately productive and is fair to good for crops and good for pasture.

Management is similar to that of Tate silt loam, undulating phase. Many areas are planted to corn for a number of years in succession and are given little or no fertilizer. Such areas produce average yields of 18 bushels an acre. Inasmuch as soil materials are constantly being washed on the soil from the surrounding uplands, fertility is maintained at a little higher level than in the soils of the uplands. Lespedeza, crimson clover, and rye are more suitable than red clover or wheat because many of the low areas are occasionally flooded. With similar fertilization and crop rotations, yields of corn, rye, lespedeza, and sorghum average 10 percent higher than on the undulating phase.

This soil is especially well adapted to sweet sorghum because of the low organic-matter content of the surface soil and the favorable moisture conditions. A sirup of excellent quality is obtained from the sorghum grown.

TOXAWAY SERIES

Although the soil of the Toxaway series is on first bottoms, it is overflowed only by unusually high water. In many places it occupies positions adjacent to uplands. External drainage is slow to very slow. Internal drainage is slow, and underdraining is usually necessary for the production of cultivated crops. Much organic matter derived from the decay of water-tolerant plants has accumulated in the upper soil layer.

With artificial draining and heavy applications of lime, the soil can be made productive for corn and for market crops of cabbage, lettuce, carrots, snap beans, potatoes, and spinach (pl. 3, B). The Toxaway series is represented by only one type—Toxaway silt loam.

Toxaway silt loam (Tx).—This poorly drained soil of the first bottoms is characterized by a nearly black surface soil and a gray plastic subsoil. The surface soil contains a large quantity of decomposed organic matter and is the darkest colored of any in the county. The soil has formed from alluvial materials derived almost entirely from wooded Porters and associated soils on steep slopes at high elevations. It is level or nearly level and has slow to very slow external drainage and slow internal drainage. The largest areas are along the Hiwassee River south of Macedonia School.

Profile description:

- 0 to 15 inches, very dark-gray or almost black crumbly highly plastic silt loam containing a comparatively large quantity of organic matter derived from decayed vegetation; mucky in some places because of the presence of a large quantity of well-decomposed woody matter; medium to strongly acid.
- 15 to 40 inches, medium-gray or dark-gray very plastic clay loam mottled or streaked with brown; material becomes bluish-gray in the lower part; slightly to medium acid.

The layers of the profile vary somewhat in color, texture, consistence, and thickness. In some places the subsoil is heavy clay loam. The soil having this subsoil is generally intermediate in development between Toxaway and Spilo soils and is not so well suited to truck crops as are the areas in which the subsoil is lighter.

Under natural conditions Toxaway silt loam is too poorly drained for the successful production of cultivated crops, although excellent bluegrass and white clover pasture is obtained on cleared land that is properly limed. Erosion control offers no problem, but drainage does. Artificial drainage is required for successful crop production. At least 40 percent of the land has been drained by the use of short open ditches. The soil is naturally well supplied with organic matter, but lime and fertilizer are required for satisfactory results with most crops.

Use and management.—Where adequately drained, Toxaway silt loam is good for crops, very good for pasture, and if properly managed, very productive of corn, cabbage, and other truck crops. A large part has been cleared for agricultural use. About 50 percent is planted to corn, 15 percent to small grains, 5 percent to cabbage, and 5 percent to other truck crops. About 15 percent is in permanent pasture, and 10 percent is in swampy woodland.

Cornland that has not been limed averages 25 bushels an acre; those areas limed and then fertilized with 150 to 200 pounds of 4-8-4 an acre average 50 bushels. In this county a single acre of Toxaway cornland that had been treated with 1½ tons of ground limestone and 300 pounds of 0-10-6 yielded 82 bushels of corn an acre.¹⁰

Small grains are subject to much damage by winterkilling. Rye, the principal small-grain crop, is not ordinarily fertilized and yields about 10 bushels an acre. Cabbage and snap beans receive the same kind of fertilizer and give about the same average yields as on Transylvania silt loam.

TRANSYLVANIA SERIES

The soils of the Transylvania series occupy positions on first bottoms similar to those of the Congaree series, but they have formed from alluvial material washed from Porters and other soils at high elevations on uplands. The chief difference between the soils of the two series is in the color of the upper layers. The Transylvania surface soil is dark grayish brown or dark brown, whereas that of the Congaree is grayish brown or brown. The Transylvania soils also have slower internal drainage and a higher content of plant nutrients, particularly nitrogen. The silt loam and fine sandy loam types of the Transylvania series are mapped.

Transylvania silt loam (Tr).—This dark-brown mellow soil, extensively developed along the upper course of the Hiwassee River and its tributaries in the mountains and along Hightower Creek, is confined to first bottoms mainly in the mountains. It has a larger acreage than any other soil of the first bottoms, and the materials from which it has derived were washed from Porters and other soils at high elevations on uplands. Its relief is level or nearly level. External drainage is slow to very slow and internal drainage is medium. The parent material has been transported by water from regions where granite-gneiss is the predominant rock. Owing to lower average temperature, more active geologic erosion, and other factors, this material is less weathered, less leached, and higher in organic matter than alluvial material derived from uplands in the lower lying plateau

¹⁰ Information obtained from W. E. Neville, county agricultural agent.

country. Differences both in character and quantity of the material have increased as a result of the removal of forest and the clean cultivation of crops on the uplands.

Profile description:

- 0 to 15 inches, dark grayish-brown or dark-brown loose very crumbly silt loam containing a large quantity of organic matter and many grit particles; easily penetrated by moisture, air, and roots; medium to strongly acid.
- 15 to 30 inches +, dark-brown very crumbly heavy silt loam containing less organic matter than the overlying layer; freely penetrated by moisture, air, and roots; medium to strongly acid.

The profile layers vary slightly in color and thickness. The soil is subject to change because sand, silt, and clay are deposited on it by overflow from adjacent streams during heavy rains.

Use and management.—Practically all of Transylvania silt loam is cleared and used principally for corn. Rye, crimson clover, cowpeas, and lespedeza are of some importance; and limited quantities of sorghum for sirup, snap beans, and potatoes are grown.

On some areas corn is followed by corn for many years in succession, but a common practice is to seed rye, crimson clover, or cowpeas in the corn at the last cultivation and to plow the crop under for green manure the following spring. A few farmers use a rotation of corn, rye, and lespedeza. In this rotation the rye is cut for grain and the lespedeza is turned under or cut for hay. Corn yields on land that is single-cropped and not fertilized range from 20 to 35 bushels an acre, or an average of 33 bushels. Rye that is not fertilized produces 10 to 14 bushels an acre and averages 13. Under current practices most farmers use 150 pounds of 4-8-4 or superphosphate an acre both for corn and rye if the crops are to be harvested as grain. With this fertilization, especially when a leguminous crop is grown in the rotation, corn yields 35 to 50 bushels an acre or averages 40; rye yields 14 to 18 bushels; and lespedeza averages 1½ tons of hay.

This soil is responsive to lime. On areas where 1 to 2 tons an acre of ground limestone has been recently applied in addition to the usual fertilization with 150 to 200 pounds of superphosphate, corn yields average 50 bushels an acre; lespedeza, about 2 tons of hay; and rye, about 18 bushels. Sorghum cane produces an estimated 150 gallons of good quality sirup an acre. Sorghum is ordinarily fertilized with 100 pounds of superphosphate. Snap beans fertilized with about 250 pounds of 4-8-4 average 150 bushels an acre, although exceptional yields of 250 bushels are sometimes obtained. Potatoes are fertilized in about the same way as snap beans and yield 100 to 250 bushels an acre. Favorable moisture conditions, high organic-matter content, and a good supply of plant nutrients render the soil well suited to commercial production of cabbage, lettuce, and carrots, but at present these are not ordinarily grown.

Included with Transylvania silt loam as mapped are about 255 acres of Congaree silt loam, dark-subsoil phase, mainly along Brasstown Creek south of Young Harris, along Hightower and Scataway Creeks near Visage, and along Wood Creek northwest of Wood Grove. This soil has drainage intermediate between that of Transylvania silt loam and Toxaway silt loam. Like Transylvania silt loam, it is best

developed in places where the parent alluvial material has been derived from Porters and associated soils lying at high elevations.

The upper 15-inch layer of Congaree silt loam, dark-subsoil phase, is dark grayish-brown or dark-brown loose very crumbly silt loam. It is high in content of finely disintegrated or decomposed organic matter that tends to separate from the mineral material when the soil is pressed between the fingers. The underlying layer to an average depth of 25 inches is friable silt loam, mottled medium gray and dark gray or black. The mottling results from poor oxidation, high organic-matter content, or a combination of these. Beneath this layer is friable silt loam, mottled with various shades of gray, but in a few places where channel gravel is close below, it is brown.

The included dark-subsoil phase of Congaree silt loam has level or nearly level relief. Artificial drainage is required in some places for best results with cereal and truck crops. The soil is easily worked and conserved and has a higher content of essential plant nutrients, especially nitrogen, than Congaree silt loam and Congaree fine sandy loam. It is medium to strongly acid, and its range of moisture content for cultivation is narrower than that of Congaree fine sandy loam. It makes good to very good cropland and very good pasture land.

At least 50 percent of Congaree silt loam, dark-subsoil phase, is used for corn; 10 percent for rye to be harvested for grain; 10 percent for permanent pasture; and 30 percent for miscellaneous purposes. About twice as much rye is seeded on cornland for green manure as is harvested for grain. The rye turned under for green manure is followed by corn or by truck crops. Corn is fertilized with 150 to 200 pounds of 4-8-4 an acre on most farms, but on a few it is fertilized with 200 to 300 pounds of superphosphate. Increased corn yields are obtained on land that has received 1 to 2 tons of ground limestone an acre. Under good management, cornland yields 30 to 65 bushels an acre; when it receives little fertilizer and no lime it yields about 35 bushels.

Rye is not ordinarily fertilized, and yields range from 10 to 18 bushels an acre (averaging 12 bushels). Soil-improving crops include crimson clover, lespedeza, and cowpeas. Permanent pasture is largely a mixture of bluegrass and white clover. Bluegrass, white clover, corn, and some other crops are reported to be benefited materially by applications of 1 ton to 1½ tons of ground limestone an acre.

Cabbage and snap beans, as well as a wide variety of other vegetables, are well adapted to this soil but they are not grown. In Union County, Ga., cabbage grown on this soil and fertilized with 800 to 1,200 pounds of 4-8-4 an acre will yield 8 to 15 tons an acre when the crop is not damaged by flooding. Snap beans fertilized with 250 to 300 pounds of 4-8-4 an acre in Union County yield 150 to 200 bushels an acre.

Transylvania fine sandy loam (Tf).—This type, derived from fine materials washed from Porters and other soils lying at high elevations, occupies positions in first bottoms along some of the streams in the mountains. It differs from Transylvania silt loam mainly in that it has more sand in the upper layer, is slightly more friable, and in some places somewhat lighter in color. The upper layer, which is grayish-

brown or dark-brown friable fine sandy loam about 15 inches thick, contains a fairly large quantity of organic matter. Below this to a depth of 30 inches or somewhat more is dark-brown or brown very friable heavy fine sandy loam. The soil is level or nearly level (usually less than 2 percent). External drainage is slow to very slow and internal drainage is medium.

Nearly all of this soil has been cleared of forest and is in agricultural use. It is very easy to work and to conserve and is high in productivity. The moisture relations for the production of crops and pasture are good.

Use and management.—Transylvania fine sandy loam makes good cropland and very good pasture land. It is used principally for crops, chiefly corn. Rye, crimson clover, cowpeas, lespedeza, snap beans, and sorghum for sirup are grown to some extent. Management practices are about the same as those for Transylvania silt loam. Under common management corn produces 35 bushels an acre; rye, 15 bushels; lespedeza, 1½ tons of hay; and snap beans, 120 bushels. Sorghum for sirup returns good yields.

TUSQUITEE SERIES

The Tusquitee soils are associated with Porters and other soils on mountains and with soils on foothills. They have been formed from materials washed or sloughed from the associated soils. They have a dark grayish-brown, dark-brown, or dark-gray loose upper layer 10 to 26 inches thick and a yellowish-brown or brown crumbly subsoil 15 to 35 inches thick. In some areas the upper layer may be as much as 30 inches thick and without change in color and texture. The members of this series are the eroded rolling and the undulating phases of Tusquitee loam and the undulating phase of Tusquitee stony loam.

Tusquitee loam, eroded rolling phase (TLG).—This brown mellow soil on foot slopes in the mountains has 7- to 15-percent slopes. It has derived from materials washed or sloughed from steep slopes of Porters soils and from rough stony land (Porters soil material). Much of it has been cleared for agricultural use, and erosion has removed a fairly large part of the original surface soil in all except a few areas. External drainage is medium to rapid and internal drainage is medium.

Profile characteristics in an uneroded forested area:

0 to 18 inches, dark grayish-brown, dark-brown, or dark-gray loose gritty loam; high organic-matter content; easily penetrated by moisture, air, and roots; medium to strongly acid.

18 to 43 inches, yellowish-brown or brown soft crumbly clay loam easily penetrated by moisture, air, and roots; medium to strongly acid.

43 to 78 inches, yellowish-brown crumbly clay loam.

78 inches +, weathered granite-gneiss.

The thickness of the profile layers varies from place to place, that of the upper layer ranging from 15 to 20 inches to as much as 30 inches in some places. In most of the eroded areas about one-half to three-fourths of the original surface soil has been removed, and the remaining soil contains much less organic matter than the uneroded soil. Variations also exist in the character of the lower part of the profile.

Below a depth of about 26 inches the subsoil in some areas consists of yellow crumbly clay loam or silty clay loam. The parent material, a mottled yellow and gray clay loam or silty clay loam, occurs at variable depths on a layer of white angular quartz fragments.

This phase is practically free of stones, has fairly good tilth, and is easy to work. It can be easily conserved on all except the stronger slopes, even though erosion has been active in most places under ordinary management. The soil absorbs moisture fairly readily and has a good moisture-holding capacity.

Use and management.—Tusquitee loam, eroded rolling phase, is productive of crops and pasture and makes good cropland and very good pasture land. About 60 percent is in crop use, 20 percent is in permanent pasture, and 20 percent is in forest of mixed deciduous trees or in miscellaneous uses. Corn, the chief crop, averages 28 bushels an acre under common management.

Permanent pasture, consisting mainly of broomsedge, other wild grasses, and a small percentage of bluegrass and white clover, has a carrying capacity of one cow to about 4 acres. Bluegrass and white clover are well adapted, and with proper applications of lime and fertilizer, about 2 acres of well-established pasture of these plants would furnish grazing for one cow.

Tusquitee loam, undulating phase (Tlu).—The upper layer of this soil consists of dark grayish-brown, dark-brown, or dark-gray loose gritty loam containing a large quantity of organic matter. It ranges from 10 to 30 inches thick but in representative profiles the range is 15 to 20 inches. Below this layer is yellowish-brown or brown soft crumbly clay loam that grades at a depth of about 45 inches into brownish-yellow crumbly clay loam soil material. Underlying at a depth of 60 to 84 inches is weathered granite-gneiss. In some places below a depth of about 26 inches the soil is yellow crumbly clay loam or silty clay loam underlain by mottled yellow and gray friable soil material that overlies a layer of white angular quartz fragments.

The very gently undulating to gently undulating relief ranges from 2 to 7 percent. External drainage is slow to medium and internal drainage is medium. The soil is mainly near the Hiwassee River and its tributaries south of Hiwassee and near the Tallulah River. About 40 percent of the soil has been moderately eroded, and in eroded areas a considerable part of the original upper layer has been removed. In some areas erosion has been only slight.

The soil is very easy to work and to conserve and it produces well. The loose loam upper layer and crumbly porous lower layers are easily penetrated by roots, air, and moisture. The high organic-matter content of the upper layer and the porous profile allow the soil to soak up rain water readily. The water-holding capacity is good. The soil is medium to strongly acid throughout.

Use and management.—Tusquitee loam, undulating phase, is principally used for crops. Owing to favorable external and internal features, it is a good to very good soil for crops and very good for pasture. About 60 percent is planted to corn, 10 percent to rye, 5 percent to cabbage, and 5 percent to snap beans. About 10 percent is in bluegrass and white clover pasture, and 10 percent is in forest of deciduous trees and in miscellaneous uses. The management prac-

tices are similar to those for Transylvania silt loam, but on the whole the yields of crops and pasture are somewhat less.

Tusquitee stony loam, undulating phase (TsU).—This soil exhibits greater variation in the organic-matter content of the upper layer than does the undulating phase of Tusquitee loam, but even though the content is variable, it generally is high. Stones are on the surface and in the soil. There are more stones in some areas than in others. The relief is level to gently undulating; slopes range up to 7 percent. External drainage is slow and internal drainage is medium. The larger areas are along the Tallulah River.

Profile description:

- 0 to 20 inches, dark grayish-brown, dark-brown, or dark-gray loose gritty stony loam; high organic-matter content.
- 20 to 43 inches, yellowish-brown or brown soft crumbly clay loam; low organic-matter content; many angular rock fragments.
- 43 to 78 inches, brownish-yellow soft crumbly very gritty clay loam containing many angular rock fragments.
- 78 inches +, weathered granite-gneiss.

Below about 26 inches some areas have yellow crumbly clay loam or silty clay loam, which is underlain by mottled yellow and gray soil material that in turn rests on roughly stratified sharply angular quartz fragments. The thickness of the profile layers varies somewhat from place to place.

This phase is relatively well supplied with organic matter, shows practically no leaching in the surface layer, and ranges from medium to strongly acid throughout. Although it is friable and crumbly, stones interfere somewhat with tillage. It has good productivity and is very easily conserved, even though some areas are moderately or slightly eroded. Along the Tallulah River and other streams some of the areas are subject to flooding. The loose loamy upper layer and soft crumbly lower layers are fairly permeable to roots, air, and moisture. The soil has good water-holding capacity.

Use and management.—Crops and pasture are the main uses of the undulating phase of Tusquitee stony loam. It makes fair to good cropland and good pasture land. Approximately 60 percent is used for crops and 30 percent for permanent pasture; the rest is in oak or mixed forest. Corn, rye, and lespedeza are the principal crops, but the soil is well suited to truck crops, especially cabbage, lettuce, snap beans, and potatoes.

Management practices, including crop rotations and fertilizer treatment, are similar to those for Transylvania silt loam. The desirability of the soil for cultivation and its crop yields vary from place to place, depending largely on the stoniness of the particular area. In general, the crop and pasture yields are about 10 percent less than on Transylvania silt loam, but in some areas they are about the same. Many areas are so located with respect to streams that irrigation is feasible and could be employed for producing vegetables in commercial quantities.

Included with this soil is about 265 acres of eroded Tusquitee stony loam with 7- to 15-percent slopes. About 20 percent of this is slightly eroded; the rest is moderately eroded and has lost a large part of the original upper layer and much organic matter. External drainage is

medium to rapid and internal drainage is medium. The larger areas of this included soil are along the Tallulah River; the smaller ones are along the upper tributaries of the Hiwassee River south of Macedonia School.

The included area of steeper Tusquitee stony loam is used chiefly for general farm crops and home vegetable gardens. Truck crops are grown to a very small extent. Most areas are suited to cabbage, snap beans, potatoes, and lettuce, but the suitability varies with the degree of stoniness of the individual area. Where it is not too stony, the included soil offers possibilities for the production of vegetables on a commercial basis. Fertilization and crop rotations are similar to those for Transylvania silt loam, but crops yield about 15 percent less.

Erosion is difficult to control on the included soil because of the strongly sloping surface, but it can be controlled with cover crops and terraces. Many areas favorably situated with respect to small streams could be feasibly irrigated during dry periods.

WARNE AND WORSHAM SERIES

Soils of the Warne series are on low terraces. They have formed from alluvium consisting of material washed from uplands underlain by igneous and metamorphic rock. They have a light-colored loose friable surface soil and a light-gray, streaked with yellow, tough very slowly pervious subsoil. Generally, external and internal drainage are slow, but in some places external drainage is medium or rapid and internal drainage is very slow. The characteristics of the soils seem to be associated with the slow external and internal drainage.

The Worsham soils are on low slopes near drainageways and have slow to very slow internal drainage. They are closely associated with Warne soils of the terraces and are mapped only in complex with those soils in this county. The Worsham surface soil is a light-gray or medium-gray friable loam 6 to 8 inches thick. The 12- to 18-inch subsoil is brownish-yellow friable micaceous silty clay loam underlain by gray silt loam containing a large quantity of mica flakes. The Worsham soils are derived from weathered material of granite-gneiss rock, although in some places colluvial material has contributed to their formation.

The Warne and the Worsham series are represented by the undulating phases and the eroded rolling phases of Warne-Worsham loams.

Warne-Worsham loams, undulating phases (WWU).—This complex includes areas of Warne and Worsham soils too small and intricately associated to be separated on the soil map.

The relief is very gently undulating and gently undulating, the prevailing gradient being about 6 percent. External drainage is slow to medium and internal drainage is slow to very slow. The areas are relatively small and are on foot slopes in the Hiwassee Plateau adjoining areas of Hayesville, Fannin, and Talladega soils. Other areas are on terraces where they are associated with Altavista soils, but they are more seepy or otherwise less well drained.

Warne loam, occupying the greater part of the complex, is characterized by a light-gray tough almost impervious layer within the profile. Worsham loam has a characteristic brownish-yellow mica-

ceous subsoil and is more friable throughout than Warne loam. A few small areas of Altavista soils are included.

In a typical profile of Warne loam the 10-inch surface soil layer is light-gray loose gritty loam, easily penetrated by plant roots. It is underlain to a depth of 36 inches or more by light-gray, streaked with brownish yellow, tough almost impervious clay.

Some variations exist in the Warne soil. The surface soil in many places consists of grayish-yellow tough clay loam underlain by a 6-inch layer of mottled yellow, gray, and yellowish-brown plastic micaceous clay loam that has a slick greasy feel. Directly beneath this layer is grayish-yellow, mottled with reddish yellow and brown, tough clay mixed with small angular quartzite fragments. It averages about 6 inches in thickness and grades into light-gray tough nearly impervious clay. In many places accumulations of white angular quartzite fragments up to 6 inches in diameter are common at variable depths.

The 7-inch surface soil of the Worsham loam is friable loam or silt loam that is light gray when dry but medium gray when moist. It is highly leached. Below this layer is brownish-yellow friable very micaceous silty clay loam underlain at an average depth of 22 inches by gray silt loam, 75 to 90 percent of which is mica flakes.

The Warne-Worsham loams complex is strongly to very strongly acid both in the surface layer and in the heavier lower layer. The tough clay layer of the Warne soil is very difficult for plant roots to penetrate and it retards the movement of air and moisture in the soil. In dry periods these soils are the first on which plants are injured by lack of moisture.

Use and management.—Warne-Worsham loams, undulating phases, is of low potential value as cropland, largely because of the extreme development of one or more undesirable features in the soils. The land is easily worked and conserved, however, and its productivity is fair. About 55 percent is under cultivation; 15 percent is permanent pasture; 10 percent is idle; 10 percent is oak forest; and 10 percent is in shortleaf pine. The crops grown and the fertilizing practices used are similar to those on Fannin clay loam, eroded rolling phase. Crop yields range widely. Corn yields 5 to 20 bushels an acre but averages 15 bushels under favorable conditions. The yields depend to some extent on soil management but largely on the variable character of the soils. Under favorable conditions, rye yields an average of 11 bushels an acre, and lespedeza, about 1 ton of hay. Where soil conditions are less favorable or where the soil is not very good, the average acre yields of corn, rye, and lespedeza are 9 bushels, 7 bushels, and $\frac{1}{2}$ ton, respectively. Lime seems to aid in increasing crop yields. A few farmers grow tobacco of high quality on some areas.

Warne-Worsham loams, eroded rolling phases (WWg).—This complex occupies 7- to 15-percent slopes on lower parts of uplands and on terraces. It is associated with Warne-Worsham loams, undulating phases, and with Altavista, Hayesville, Fannin, and Talladega soils in various parts of the Hiwassee Plateau. Aside from the moderately to strongly sloping relief and somewhat more eroded condition, it is similar to Warne-Worsham loams, undulating phases.

External drainage is medium to rapid and internal drainage is slow to very slow.

Considerable variation exists in the extent of erosion in different areas. Approximately one-third of the total area has been slightly eroded. Nearly all the rest has been moderately eroded, and one-half to three-fourths of the original surface soil has been washed off. Lower on the slopes, heavier material is mixed with the plow layer in most areas. In some places the surface soil and subsoil are so mixed that the plow layer is a gritty clay loam. Severe erosion in a few areas has removed all the surface soil and has exposed the yellow and gray lower material.

Use and management.—Warne-Worsham loams, eroded rolling phases, is fairly easy to work and conserve and is fairly productive. It is fair for crops and pasture. About 50 percent is under cultivation; 15 percent is in permanent pasture; 10 percent is lying idle; and 25 percent is in shortleaf pine. The principal crops are corn, rye, and lespedeza, which yield 13 bushels, 9 bushels, and $\frac{3}{4}$ ton, respectively, under common management. Ordinarily the carrying capacity of pasture is one cow to about 5 acres, but with good management two cows could be supported on the same acreage.

SOIL ASSOCIATIONS

Examination of the detailed soil map shows that different combinations of soils occur in various parts of the county. In one part for example, steep shallow soils of the Porters series predominate but narrow strips of Tusquitee soils occur infrequently along a few of the drainways. In another part smooth productive soils of the narrow bottom lands are intermingled with rolling to hilly soils of the upland.

The first part, except for the few areas of the Tusquitee soils, is poorly suited to agriculture; productivity is low; and workability on a very great percentage is almost impossible. Practical use is limited to forest. The second part consists of a few areas of productive soils well suited to crops requiring tillage, but these are closely associated with extensive areas of soils of limited suitability for crops and pasture, and with small areas of soils suited only to forests. In contrast with the landscape first described, this part of the county is relatively well suited to general farming. Much of it is cleared and occupied, and the hazards of runoff present a serious problem in the maintenance of a prosperous agriculture.

Broad soil landscapes of the kinds just discussed are known as soil associations and may be defined as "areas throughout which a characteristic soil pattern tends to reoccur or repeat itself." Each association is relatively uniform as to kinds, proportions, and geographic patterns of soils, although the individual soils in each may differ greatly one from another. The distinctions between such soil landscapes, or soil associations, is of importance to community or regional agricultural planning. A map showing the extent and distribution of soil associations and accompanying descriptions of each association, is of value in agricultural planning. Four soil associations have been recognized in Towns County (fig. 2).

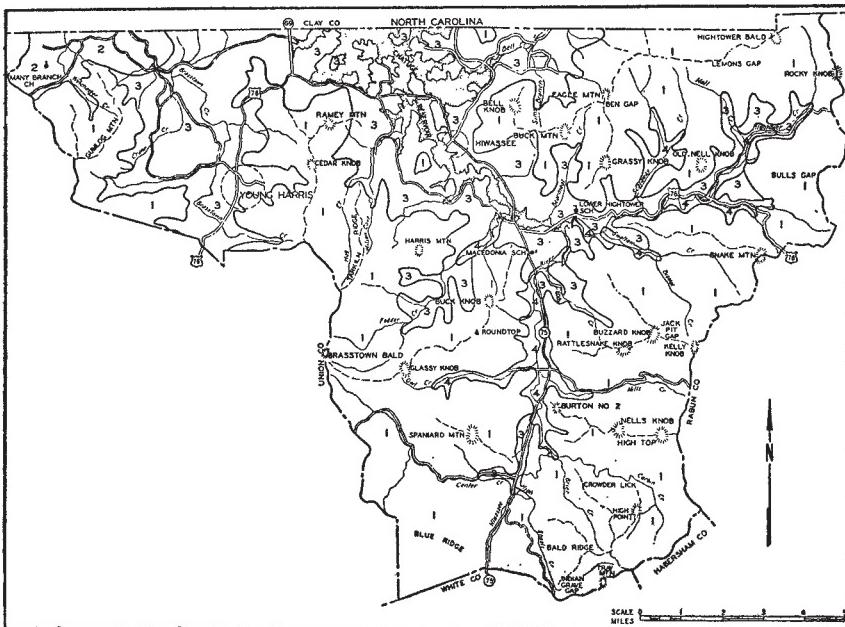


FIGURE 2.—Soil associations in Towns County, Ga.: (1) Porters-Rough stony land (Porters soil material), (2) Fannin-Altavista-Cheewacla, (3) Hayesville-Porters-Altavista, and (4) Transylvania-Toxaway-Hayesville.

PORTERS-ROUGH STONY LAND (PORTERS SOIL MATERIAL) ASSOCIATION

The Porters-Rough stony land (Porters soil material) association consists of more mountainous areas and is characterized by steep to very steep slopes occupied by stony soils that are generally shallow to bedrock. Porters stony loam, steep phase, and Rough stony land (Porters soil material) predominate. These soils are not suited to either crops or pasture, and practically the entire area is occupied by deciduous forest, predominantly oaks with white pine and hemlock at the higher elevations.

FANNIN-ALTAVISTA-CHEWACLA ASSOCIATION

The Fannin-Altavista-Cheewacla association consists chiefly of reddish highly micaceous soils developed over mica schist and having rolling to hilly relief. Narrow strips of soils on low stream terraces and bottoms having smooth or nearly level relief are associated with them. Small sections throughout the association are too steep or stony for either crops or pasture. The hilly areas that have been severely eroded are poorly suited to either crops or pasture, and some of the rest of the association is suited only to pasture. Over half the area is fair to good cropland. Much of the soil suited to crops is under forest.

This association is well suited to general farming. Corn, rye, and lespediza are the chief crops. Control of runoff and adequate fertilization are important in soil management.

HAYESVILLE-PORTERS-ALTAVISTA ASSOCIATION

The Hayesville-Porters-Altavista association, along with the Fannin-Altavista-Chewacla association, covers most of the Hiwassee Plateau, or intermountain part of the county. The two associations are similar but the upland soils of the Hayesville-Porters-Altavista are less micaceous and more porous than the upland soils of the Fannin-Altavista-Chewacla association. The Hayesville soils are developed from granite-gneiss in this county, whereas the Fannin soils are developed from mica schist.

Probably two-thirds of the Hayesville-Porters-Altavista association is suited to crops, and most of the rest affords pasture under proper management. Only a small area is not suited to one or the other of these uses. A limited part of these soils is on bottoms widely distributed throughout the area and is very productive and well suited to intensive use. Most of the soils of the upland are of moderate fertility and, because of their slope, require careful management if they are to be built to and maintained in a fairly productive state.

Much of this association is cleared and used either for crops or pasture, but many upland soils suitable for tillage are under forest. On a whole, the area is suited to general farming, corn, lespedeza, and rye being the chief crops. The smooth fertile well-drained soils of the bottom lands and stream terraces are well suited to snap beans, cabbage, and potatoes.

TRANSYLVANIA-TOXAWAY-HAYESVILLE ASSOCIATION

The Transylvania-Toxaway-Hayesville association lies along the two largest streams of the county. It consists of moderately broad areas of soils on bottom land and low stream terraces and associated limited areas of predominantly hilly to steep upland soils. The soils on the stream terraces and bottom lands are almost entirely cleared. They are fertile, easily worked, and well suited to intensive use when adequately fertilized; consequently, they are well suited to crops. The Toxaway soil, however, requires artificial drainage before it can be intensively cropped. Most of the upland soils are suited only to pasture because of their strong slopes, and a large part of them is in forest. General farming prevails. Corn, hay, small grains (chiefly rye), and such truck crops as snap beans, cabbage, and potatoes are the principal crops.

**CLASSIFICATION, MANAGEMENT, AND PRODUCTIVITY OF
TOWNS COUNTY SOILS****LAND CLASSIFICATION**

The soils of the county are grouped in five classes on the basis of their relative physical suitability for agricultural use. In order of decreasing desirability for use in the present agriculture, they are grouped as First-, Second-, Third-, Fourth-, and Fifth-class soils. Although the soils of no one class are ideal for the existing agriculture, the First-class soils more nearly approach that ideal than those of the Second-class. Likewise, the soil of each succeeding class is further from the ideal than that of the preceding class.

Three conditions—productivity, workability, and conservability—determine the suitability of a soil for agricultural use. Productivity

refers to the ability of the soil to produce crops under prevailing farm practices. The soil may be productive of a crop, but not well suited to it because of poor workability or poor conservability, or both.

Workability refers to ease of tillage, harvesting, and other field operations. It is affected by soil texture, structure, consistence, organic-matter content, and moisture conditions and by slope and stoniness. A soil may be highly productive and easily conserved but very difficult to work.

Conservability refers to the ease with which productivity and workability can be maintained.

An ideal soil for agriculture is easily worked, can be conserved with a minimum of effort, and readily produces a large number of important crops. Congaree fine sandy loam, Congaree silt loam, and Transylvania silt loam probably come nearer the ideal than the other soils of the county, although they fall short to some extent.

As far as information was available, the relative suitability of the soils for agriculture was determined from the experience of farmers, field men, and others who work with the soil. For example, a farmer knows that some soils on his farm are more desirable for certain uses than others, and by comparisons of this nature within a farm and between farms, the soil units were ranked in the order of their desirability for the agriculture of the county. Where information based on experience was not obtainable, the agricultural suitability was judged by comparing the soils to others of similar character for which information was obtainable. Arbitrary limits were then selected for grouping the soils in five land classes.

In ranking the soils and in choosing the limits for the land classes, it was generally assumed that a soil well suited only to pasture or forest is less desirable than one well suited to crops but rather poorly suited to pasture. Likewise, it was assumed that a soil well suited only to forest is less desirable than one well suited only to pasture. These assumptions may not be valid for any one farm, but it is thought that they are valid for most of the farms in the county.

The grouping of the soils in land classes does not constitute recommendations for land use. The grouping is made to provide information about the relative suitability of the various soils for the present agriculture of the county. Knowledge of a great many factors relating to a specific farm is necessary before recommendations for land use on that farm can be made.

FIRST-CLASS SOILS

The First-class soils are good to excellent for crops and very good to excellent for pasture. They differ in degree of profile development, character of parent material, color, structure, and other respects but are relatively similar in their general suitability for agricultural use. All are fairly well supplied with plant nutrients, as compared to other soils of the county, but even the most fertile of them is responsive to additions of amendments for some crops. They are all acid and need lime. All are well drained except Toxaway silt loam, which has slow internal drainage. Their physical properties are such that they retain moisture well, and this tends to insure an even and adequate supply for plant growth. Good tilth is easily maintained; the range in moisture conditions for tillage is comparatively wide, except in Tox-

away silt loam. The soils are relatively well supplied with organic matter, as compared to other soils of the county. Except for Toxaway silt loam, the physical properties of these soils favor normal circulation of air and moisture; and roots penetrate all parts of the subsoil freely.

None of these soils is characterized by any prominent adverse soil condition. They are almost free from stones; the relief is favorable to soil conservation and tillage; and none of them is severely eroded or highly susceptible to erosion.

The natural productivity of these soils is relatively high. They are easily tilled, and the problem of conserving their fertility and material is relatively simple. All are well suited to most of the exacting and intensive crops of the county when those crops are grown under prevailing systems of management.

The First-class soils of the county are as follows:

Congaree fine sandy loam	Toxaway silt loam
Congaree silt loam	Transylvania fine sandy loam
Hiwassee loam:	Transylvania silt loam
Eroded undulating phase	Tusquีee loam:
Undulating phase	Eroded rolling phase
State silt loam, undulating phase	Undulating phase

SECOND-CLASS SOILS

The Second-class soils are fair to good for crops and very good to good for pasture under present farming practices. Like the First-class soils, this class is made up of soils having great diversity in physical characteristics (even greater than that of the First-class soils). The soils of the two classes are relatively similar in physical suitability for use in agriculture, but they may differ in productivity, workability, and conservability. Each Second-class soil is moderately deficient in one or more of these conditions, with the result that it is less suitable for agricultural use than any of the First-class soils and more suitable than any of the Third-class soils.

The Second-class soils are at least moderately productive of most crops grown in the county, and their physical properties are moderately favorable to tillage, maintenance of good tilth, and normal circulation and retention of moisture. None occupies very strong relief and none, except in a few places, is extremely stony or severely eroded. Internal drainage is slow or slow to very slow in some of the soils. In short, each of these soils is moderately deficient in one or more desirable characteristics, but it is not so deficient in any characteristic that it is poorly suited to agricultural use.

The Second-class soils are as follows:

Altavista loam:	Hayesville stony clay loam, eroded rolling phase
Undulating phase	Hayesville stony loam, rolling phase
Undulating low terrace phase	Hiwassee loam, eroded rolling phase
Balfour loam, rolling phase	Rabun stony clay loam, eroded rolling phase
Chewacla silt loam	Tate-Cheawacla silt loams
Fannin loam, rolling phase	Tate silt loam:
Hayesville clay loam, eroded rolling phase	Eroded rolling phase
Hayesville loam:	Undulating phase
Eroded undulating phase	Tusquīee stony loam, undulating phase
Rolling phase	

THIRD-CLASS SOILS

The Third-class soils are poor to fair for crops and fair to good for pasture under prevailing farming practices. Each soil is characterized by one or a combination of features sufficiently adverse to limit its physical suitability for the production of the common tilled crops under prevailing farming practices, but no feature is so limiting as to render the soil unsuited to tilled crops. In Third-class soils, one or more of the following undesirable features is prominent: Low content of plant nutrients and organic matter, shallowness to bedrock, strong slope, susceptibility to erosion, eroded condition, and slow to very slow internal drainage.

Third-class soils are better suited physically to crop production under prevailing systems of management than Fourth-class soils, but are less well suited to crop production than Second-class soils. Their best use depends on the manner in which they occur, the other soils in the farm unit, the type of farm, and economic conditions.

The Third-class soils are as follows:

Altavista clay loam:		Spiro silty clay loam, better drained phase
Eroded rolling phase		Warne-Worsham loams:
Eroded undulating phase		Eroded rolling phases
Fannin clay loam, eroded rolling phase		Undulating phases
Hayesville clay loam, severely eroded rolling phase		

FOURTH-CLASS SOILS

The Fourth-class soils are poorly suited to cultivated crops grown under prevailing farming practices but are at least fairly productive of pasture plants. As workability or conservability, or both, are difficult, it is generally not feasible to cultivate these soils; but they have fertility and moisture relations good enough to sustain at least a moderate cover of pasture plants. In general they are best suited to use as pasture land under the prevailing farm practices. Where enough fair to good cropland is available, much of their acreage is in such use. The greatest acreage is now used for forest, largely because it is in isolated parts of the county. Some areas, however, are used for cultivated crops.

The Fourth-class soils are as follows:

Alluvial soils, undifferentiated	Porters-Balfour loams, hilly phases
Balfour stony loam, eroded rolling phase	Porters-Balfour stony clay loams, eroded hilly phases
Fannin clay loam, eroded hilly phase	Porters loam:
Fannin-Talladega loams, hilly phases	Eroded steep phase
Hayesville clay loam:	Steep phase
Eroded hilly phase	Porters-Balfour stony loams, hilly phases
Severely eroded hilly phase	Rabun stony clay loam:
Hayesville loam, hilly phase	Eroded steep phase
Hayesville stony loam, hilly phase	Steep phase
Hayesville stony clay loam, eroded hilly phase	Spilo-Chewacla silt loams
Hiwassee-Hayesville stony loams, eroded hilly phases	Spilo silty clay loam
Porters-Balfour clay loams, eroded hilly phases	Stony colluvium (Porters and Hayesville soil materials)

FIFTH-CLASS SOILS

The Fifth-class soils are poorly suited both to cultivated crops and to pasture under prevailing conditions. Each soil is so difficult to work or to conserve, or both, that cultivation is not feasible in the prevailing system of farming. Each soil is sufficiently low in content of plant nutrients or has such poor moisture relations, or both, that common pasture plants produce little feed. Although forest trees grow more slowly on many of these soils than soils of the other four classes, the Fifth-class soils are better suited physically to forest than to crops or to pasture. Where a farm has no better soils, however, a farmer may have to use some Fifth-class soils for pasture or crops, even though they are poorly suited to such uses.

Each soil of this class is characterized by one or more of the following undesirable features: Hilly, steep, or very steep relief; high content of loose stones; shallowness to bedrock; numerous outcrops of bedrock; or severe erosion. In addition, some of them are low in content of available plant nutrients, are excessively drained, and are strongly to very strongly acid. As a result of these undesirable characteristics, productivity both for tilled crops and pasture plants is low, and tillage with common farm implements is either impossible or very difficult. Some of the soils can be cultivated only with hand implements. If the soils are used for crops, they require careful management for their conservation.

The Fifth-class soils are as follows:

Fannin clay loam, severely eroded hilly phase	Porters stony loam: Eroded steep phase
Hayesville clay loam: Eroded steep phase	Steep phase
Severely eroded steep phase	Very steep phase
Hayesville loam, steep phase	Rough gullied land (Hayesville soil material)
Hayesville stony clay loam, severely eroded hilly phase	Rough stony land (Porters soil material)
Hayesville stony loam, steep phase	Talladega clay loam, severely eroded steep phase
	Talladega loam, steep phase

LAND USE AND SOIL MANAGEMENT

This section on land use and soil management presents information relating to (1) the present use and management of the soils of the county and (2) some of the requirements for good management of the soils.

The term "land use" refers to broad uses, as for (1) cultivated crops, (2) permanent pasture, and (3) forest. The term "soil management" refers to such practices as (1) choice and rotation of crops; (2) application of lime, commercial fertilizer, and manure; (3) proper tillage; and (4) control of water on the land by engineering methods.

The soils of Towns County differ considerably in management practices required because they differ in characteristics affecting workability, conservability, and productivity, all of which are related directly to management requirements.

In suggesting management practices for the various soils, it is recognized that certain practices may not be feasible for some farmers in their present circumstances, but those suggested are feasible for the majority of farms under present conditions. Many farmers attain the

same objective by using combinations of management practices better suited to their particular conditions than those given in this section.

Although there has been considerable attempt to fit use and management of the soils in Towns County to their physical character, many farmers still give little heed to proper land use and soil management. The early method of obtaining farm land (drawing by lot) resulted in the misuse of much of the land and, consequently, to widespread soil depletion and the abandonment of many farms.

Estimates of the proportionate use of most of the soils at the present time, as given under the discussions of the soil units in the section on Soils, show that use of a single soil may differ greatly in different parts of the county or among farms in the same part of the county.

The soils of the county are commonly deficient in nitrogen, phosphate, potash, and calcium and they generally have lower acidity than is best for most crops adapted climatically to the region. Soluble aluminum compounds are present in quantities of 50 to 500 pounds an acre. If the quantity exceeds 250 pounds an acre it is considered toxic to plant growth. Lime in proper quantities would supply calcium that would decrease the solubility and toxicity of the aluminum compounds. When soil acidity has been lowered, the phosphate in the soil becomes more available to plants, and phosphate supplied by fertilizers becomes more efficient. The addition of nitrogen, phosphate, potash, and lime, therefore, is generally necessary to obtain maximum production. There is increasing need for some of the minor elements such as boron for various legume seed crops. The analyses of several composite samples of soils in Towns County are given in table 9.

Only Talladega clay loam, severely eroded steep phase, is well supplied with available potassium, as is shown in table 9. Inasmuch as this soil is shallow to bedrock and in most places too steep for the production of cultivated crops, its potassium content is of little material benefit. Its potash content is doubtless indicative of the content in other Talladega soils of the county.

The nitrate-nitrogen content of the soils, although generally low, depends on soil type and cropping practices and, to a minor degree, on climatic conditions at the time the soil sample was taken. Ammonia becomes available in the form of nitrate through bacterial action.

Magnesium is essential to plant growth, as it makes up a part of the green coloring matter of plants, but only small quantities are required. Where it is present in sufficient quantities, it is beneficial in reducing soil acidity. Manganese is a common constituent of soils and plants, and small quantities are apparently necessary to normal plant growth.

In addition to the chemical deficiencies that must be supplied, the physical characteristics of the soil are important. These characteristics include lay of the land; degree of erosion; depth of soil to bedrock; soil texture, consistence, structure, porosity, and tilth; and organic-matter content of the soil. Any of these characteristics may influence favorably or unfavorably the suitability of the soil for crops and other uses.

In general, the management of a soil for any one cultivated crop is modified by the management of that soil for other crops grown in

TABLE 9.—*pH determinations and available plant nutrients and soluble aluminum in 18 soils in Towns County, Ga.¹*

Soil	Number of soil samples	pH ^a	NO ₃	P ^b	K ^c	Ca ^d	Pounds	Pounds	Pounds
Altavista loam, undulating phase:									
Surface soil	3	5.0	7.0	0	0	0	44.0	44.0	117
Subsoil	3	5.0	2.0	0	0	0	44.0	44.0	183
Chewacla silt loam:									
Surface soil	1	4.7	15.0	20.0	160.0	75.0	250		
Subsoil	1	4.6	10.0	10.0	120.0	58.0	100		
Congaree silt loam:									
Surface soil	4	5.4	15.0	7.5	75.0	400			
Subsoil	4	5.2	12.5	12.5	58.0	425			
Congaree fine sandy loam:									
Surface soil	5	5.2	1.0	10.0	71.0	170			
Subsoil	5	5.3	3.0	0	40.0	160			
Fannin loam, rolling phase:									
Surface soil	9	5.4	15.0	8.0	138.0	278			
Subsoil	9	5.3	6.0	0	154.0	228			
Fannin clay loam, eroded rolling phase:									
Surface soil	6	5.3	6.0	8.0	112.0	250			
Subsoil	6	5.3	5.0	5.0	123.0	200			
Hayesville loam, rolling phase:									
Surface soil	4	5.3	1.0	0	69.0	112			
Subsoil	4	5.4	0	0	59.0	90			
Hayesville clay loam, eroded rolling phase:									
Surface soil	3	5.6	3.0	0	112.0	175			
Subsoil	2	5.7	0	0	156.0	250			
Hivassae loam, undulating phase:									
Surface soil	2	5.4	2.5	25.0	140.5	125			
Subsoil	2	5.4	0	12.5	170.5	175			

the rotation. The length and kind of rotation are factors of management as well.

Although each soil may have individuality as to its use suitability and management requirements, the soils of the county are placed in a small number of groups for convenience. The members of each group are comparatively similar in use suitability and management. All the soils at least fairly well suited to crops requiring tillage are grouped together on the basis of management requirements. These are the First-, Second-, and Third-class soils discussed in the section on Land Classification. In order to discuss management requirements the soils of these three classes are placed in groups, which are referred to as A-1, A-2, and A-3. The soils considered poorly suited to crops requiring tillage, but which are at least fairly well suited to permanent pasture (Fourth-class soils), are divided into groups B-1 and B-2, and management requirements for pasture are discussed. The soils considered poorly suited to crops that require tillage and to permanent pasture (Fifth-class soils) are in group C-1.

SOILS AT LEAST FAIRLY WELL SUITED TO CROPS REQUIRING TILLAGE

The soils at least fairly well suited to crops that require tillage are placed in three groups, and management practices considered suitable for the soils of each group are given.¹¹ The suggested management practices include crop rotations, the use of amendments, and engineering methods for the control of water.

GROUP A-1

The soils of Group A-1 are derived from transported material deposited as alluvium along streams or as wash or slough on foot slopes. The relief ranges from level to gently sloping but in some areas it is moderately and strongly sloping. Except for the State, Tusquitee, and Tate soils, which have been slightly or moderately eroded in places, the soils of this group have been affected very little or none by accelerated erosion. The surface layer of the soils is sufficiently thick to constitute nearly everywhere all of the plowed layer, and very little or no subsoil is brought up by the plow. Tillage is fairly easy. Moisture relations are generally good for tillage, but the range in moisture content is narrow in some of the soils. Small areas in most of the soils are poorly drained internally and require underdrainage for best results from most crops. Toxaway silt loam, Chewacla silt loam, and Tate-Chewacla silt loams have slow internal drainage, but most areas are adequately drained by ditches. Wheat is liable to be winterkilled on areas with poor internal drainage.

Corn is the principal crop; rye, wheat, oats, lespedeza, red clover, crimson clover, soybeans, and cowpeas are less important. Snap beans, potatoes, and cabbage are produced as truck crops. Areas of some of the soils are used for permanent pasture, and some small areas are wooded. The soils of management Group A-1, with their land class and relative workability and conservability, are given in table 10.

¹¹ Information on crop rotations, kinds of fertilizer recommended, rates of application, and pasture improvements furnished by the county agricultural agent and the Georgia Agricultural Experiment Station at the time of survey.

TABLE 10.—*Land class and workability and conservability in relative descriptive terms of soils of management group A-1, Towns County, Ga.*

Soil	Land class	Workability	Conservability
Transylvania silt loam-----	First-----	Excellent-----	Excellent.
Transylvania fine sandy loam-----	do-----	Very good to excellent.	Do.
State silt loam, undulating phase.	do-----	Excellent-----	Very good.
Toxaway silt loam ¹ -----	do-----	Good-----	Excellent.
Congaree silt loam-----	do-----	Excellent-----	Do.
Congaree fine sandy loam-----	do-----	do-----	Very good.
Tusquitee loam:			
Undulating phase-----	do-----	Very good-----	Do.
Eroded rolling phase-----	do-----	do-----	Do.
Chewacla silt loam ¹ -----	Second-----	Good-----	Excellent.
Tate-Chewacla silt loams-----	do-----	Good to very good-----	Do.
Tate silt loam:			
Undulating phase-----	do-----	Very good-----	Do.
Eroded rolling phase-----	do-----	Good-----	Good.
Tusquitee stony loam, undulating phase.	do-----	do-----	Very good.

¹ Where adequately drained.

Present management.—Crop rotations are used on some of the acreage of group A-1 soils. A 3-year rotation of corn, wheat or rye, and red clover and a 3-year rotation of corn, rye, lespedeza or crimson clover are the most common. In the first rotation corn receives 150 to 200 pounds an acre of 2-10-2 mixture, and in the second, 200 pounds of 4-8-4 mixture. Other fertilizer treatment for corn consists of 100 to 150 pounds an acre of superphosphate. A few farmers apply 200 to 300 pounds of superphosphate an acre and side-dress corn with 100 pounds an acre of nitrate of soda. Rye, when fertilized, receives 150 pounds an acre of superphosphate.

On some farms corn is grown year after year with little or no fertilizer. For some crops, ground limestone is applied in quantities of 1 to 2 tons an acre. Truck crops receive moderate to heavy applications of complete fertilizer.

Management requirements.—Most farmers prefer a short crop rotation for the State, Transylvania, Congaree, Tusquitee, Tate, Chewacla, Tate-Chewacla, and Toxaway soils. A rotation of corn and crimson clover seems advisable. The crimson clover is broadcast when the corn is laid by and is turned under the following spring for green manure. The corn should be fertilized with 200 to 400 pounds an acre of 3-9-5 or 4-8-6 mixture. When a 3-year rotation of corn, rye, and lespedeza is practiced, the rye should be fertilized with 150 to 300 pounds an acre of 0-10-4 mixture. In some instances where State silt loam, undulating phase, has been well limed and is in a high state of fertility, a 3-year rotation of corn, wheat, and red clover should be satisfactory. In this rotation corn should receive 200 to 400 pounds

an acre of 4-8-4 or 4-10-4 mixture, and the wheat, 100 to 300 pounds an acre of 0-16-0.

Lime is a very important amendment for group A-1 soils. In this county the agricultural agent reported that a 3½-acre tract of Toxaway silt loam normally produced about 20 bushels of corn an acre, but when this same area was treated with 1¼ tons of ground limestone and 350 pounds of 0-10-6 fertilizer an acre, it produced an average of 82 bushels an acre.

Toxaway silt loam is poorly drained under natural conditions, as it is covered with water most of the time. Red maple and alder are common on the virgin soil, and water sedges and other water-tolerant plants are common on the cleared soil. Close spacing of ditches is necessary to drain the soil adequately for cultivated crops. Chewacla silt loam, Tate-Chewacla silt loams, and Transylvania silt loam require some drainage but not so much as Toxaway silt loam.

Congaree, State, Tusquitee, Toxaway, and Chewacla soils are well suited to truck crops. Cabbage, potatoes, snap beans, and tomatoes are the principal vegetables grown for sale and for domestic use, but turnips, collards, bell peppers, beets, carrots, squash, onions, and pumpkins are grown to some extent. A number of other vegetables, as rhubarb, radishes, lima beans, cucumbers, and greens, are grown in most home gardens for table use but are seldom produced for sale. Very little spinach and lettuce have been grown on a commercial basis. They seem to require a soil of high fertility, which when well drained, has excellent structure but only a moderate organic-matter content. These qualities are best in the State, Congaree, and Tusquitee soils.

GROUP A-2

The soils of group A-2 with the exception of the Hiwassee soils, which consist of alluvium, are derived from weathered material of granite-gneiss or micaceous schist. The Hiwassee soils are on high stream terraces and have very gently sloping to strongly sloping relief; the others are on uplands, mainly in intermountain valleys, and have gently undulating to rolling relief. External drainage ranges from slow to rapid but is mostly slow to medium, and internal drainage is medium. Workability ranges from poor in some soils to very good in others but it is mostly good and very good. The conservability is very good in Hiwassee loam, undulating phase; Hiwassee loam, eroded undulating phase; Balfour loam, rolling phase; and Hayesville loam, eroded undulating phase; and poor in Fannin clay loam, eroded rolling phase; and Hayesville clay loam, severely eroded rolling phase. Conservability is fair or good in the rest of the soils of this group.

Although a large part of group A-2 soils has been cleared for agricultural use, it would be feasible to clear additional areas when the need for more cropland arises. Most of the cleared land is cropped. Some areas are used for permanent pasture; a few are lying idle; and a few others are grown over with shortleaf pine.

Corn is the principal crop; but rye, wheat, lespedeza, red clover, and crimson clover are also important. Cowpeas and sorghum for sirup are grown to some extent. Snap beans, potatoes, and cabbage are produced on some of the soils. The soils of this group, together with their land class, workability, and conservability, are listed in table 11.

TABLE 11.—*Land class and workability and conservability in relative descriptive terms of soils of management group A-2, Towns County, Ga.*

Soil	Land class	Workability	Conservability
Hiwassee loam:			
Undulating phase	First	Very good	Very good.
Eroded undulating phase	do	do	Do.
Eroded rolling phase	Second	Good	Good.
Balfour loam, rolling phase	do	Very good	Very good.
Hayesville loam:			
Eroded undulating phase	do	do	Do.
Rolling phase	do	Good	Good.
Hayesville clay loam, eroded rolling phase.	do	Fair	Fair.
Hayesville stony loam, rolling phase	do	do	Good.
Hayesville stony clay loam, eroded rolling phase.	do	Poor	Fair.
Fannin loam, rolling phase	do	Good	Do.
Rabun stony clay loam, eroded rolling phase.	do	Fair	Do.
Fannin clay loam, eroded rolling phase.	Third	Good	Poor.
Hayesville clay loam, severely eroded rolling phase.	do	Poor	Do.

Present management.—Crop rotations are used to some extent on most soils of group A-2. Corn, however, is grown continuously in some fields without the use of fertilizer and cover crops, and this practice causes rapid deterioration of the soil. In some fields corn and rye are grown in alternate years. A crop rotation that is used to some extent consists of corn, rye seeded in the corn, and lespedeza seeded later in the rye. In the second year the rye is harvested for grain, and the lespedeza is left on the land for soil improvement. In the third year corn is planted again or the lespedeza is allowed to reseed the land for pasture. In this rotation corn is fertilized with 100 to 200 pounds an acre of 2-10-2 or 4-8-4 or with the same quantity of superphosphate. Rye, when fertilized, receives 100 pounds an acre of superphosphate. Lespedeza generally is not fertilized, but the land is treated with 1 to 1½ tons of ground limestone every 5 or 6 years.

Another rotation used to some extent keeps a cover on the ground most of the year. It is made up of corn, wheat or rye, and lespedeza, red clover, or crimson clover. The crimson clover is used as a green-manure crop and is turned under in spring before the corn is planted. In this rotation 100 to 200 pounds an acre of 4-8-4 fertilizer is usually applied in the corn rows and the wheat or rye generally receives 100 to 200 pounds of superphosphate. Some farmers apply 1 to 1½ tons of ground limestone an acre to the land for crimson and red clovers. Stable manure, when available, is applied to cornland. Fertilizer is applied in comparatively heavy quantities to land used for truck crops.

Terraces are used to control erosion on Hayesville clay loam, eroded rolling phase, the most extensive soil of group A-2. Strip cropping is practiced on a few areas as a further aid in controlling erosion.

Management requirements.—A 3-year rotation practiced by some farmers is suitable for the soils of group A-2. For this rotation an initial application of 1 to 2 tons of ground limestone an acre should be made, and applications of 1 ton an acre should follow at 3- to 5-year intervals. The first year of the 3-year rotation, corn is interplanted with cowpeas or soybeans, or either cowpeas or soybeans are sown at the last cultivation of the corn. The fertilizer treatment for the corn is 200 to 400 pounds an acre of 4-8-4 or 4-10-4 mixture. The corn is followed in fall by a small-grain crop drilled in and fertilized with 100 to 300 pounds of 0-16-0 an acre.

The second year of the 3-year rotation, 25 pounds an acre of lespedeza is broadcast in spring over the small grain. Some farmers prefer a mixture of 20 pounds of lespedeza and 5 pounds of red clover or alsike clover for land recently limed and in a high condition of fertility. When the small grain has been harvested, the lespedeza is allowed to remain on the ground or is cut for hay. Crimson clover is broadcast over the land late in summer or small grain is drilled in the lespedeza in fall. The crimson clover or the red clover or alsike clover sown in spring, together with the small grain, furnishes a winter cover. In the third year the crimson clover or small grain is turned under for green manure, and the land is planted to corn.

Where Balfour loam, rolling phase, has been adequately limed and is otherwise in a high state of fertility, a 3-year rotation of corn, wheat, and red clover might be preferred.

If snap beans are grown on a commercial basis, it is suggested that they be substituted for corn in the rotation and that they be fertilized with 800 to 1,000 pounds of 4-8-6 mixture an acre. If late beans are grown, they may be preceded by an early crop of cabbage fertilized with 1,000 pounds of 4-8-6 an acre. The quantity of fertilizer for beans following the cabbage can be materially less than that ordinarily applied for beans.

Nearly all the cleared areas of this group have been slightly or moderately eroded, and in some places, severely eroded. Unless carefully managed, most of the uncleared land would be subject to considerable erosion if it were cleared. On soils of gentle slope, as Hayesville loam, eroded undulating phase, erosion can be controlled in most places by the use of crop rotations that include cover crops during winter and by the use of fertilizer that keeps the productivity of the soil at a high level.

Forested soils, as the rolling phases of Hayesville and Fannin loams, should be terraced, strip cropped, and protected by a winter cover of close-growing crops when cleared.

In this group, Hayesville clay loam, severely eroded rolling phase, has lost most of its surface soil through erosion. It requires careful management, including the use of crop rotations, proper fertilizing and liming, and engineering practices for the control of runoff, in order to produce satisfactory yields of corn, small grain, legumes, and pasture.

GROUP A-3

The Altavista, Spilo, and Warne soils of group A-3 have formed from alluvium consisting of sand, silt, and clay deposited near streams by running water; whereas the Worsham soils have formed in place, mainly on weathered material from granite-gneiss.

The soils of group A-3 are level to gently sloping for the most part, but over a fairly large area they are moderately sloping and strongly sloping. External drainage is dominantly very slow to medium, but in a large area it is rapid. Internal drainage is generally slow, although in some of the soils it is very slow. The workability of the soils ranges from very good to fair, and their conservability ranges from very good to poor.

An estimated 35 to 80 percent of these soils is used for crops; 10 to 20 percent is used for pasture; 5 to 15 percent is idle; and 5 to 30 percent is forested.

Corn, rye, and lespedeza are the principal crops. Cowpeas and crimson clover are of minor importance. Tobacco of good quality is grown on Altavista loam, undulating phase, and Warne-Worsham loams, undulating phases. Soils of this management group, together with their land class and workability and conservability, are given in table 12.

Present management.—Crop rotations are used to some extent on soils of group A-3, and the most common is a 3-year rotation of corn, rye, and lespedeza. In this rotation crimson clover or cowpeas sometimes is substituted for lespedeza. Corn is fertilized with 100 to 200 pounds an acre of 2-10-2 or 4-8-4 or with the same quantity of superphosphate. When fertilized, rye receives 100 to 125 pounds an acre of superphosphate. Ground limestone is applied to some areas of the soils, especially areas of Altavista loam, undulating phase; Spilo silty clay loam, better drained phase; and Warne-Worsham loams, undulating phases. Most of the cultivated areas of Altavista loam, undulating low terrace phase, and practically all the areas of Spilo silty clay loam, better drained phase, have been artificially drained.

TABLE 12.—*Land class and workability and conservability in relative descriptive terms of soils of management group A-3, Towns County, Ga.*

Soil	Land class	Workability	Conserva-bility
Altavista loam:			
Undulating low terrace phase	Second	Very good	Very good.
Undulating phase	do	do	Do.
Altavista clay loam, eroded undulating phase.	Third	Fair	Fair.
Spilo silty clay loam, better drained phase.	do	Good	Very good.
Warne-Worsham loams:			
Undulating phases	do	do	Good.
Eroded rolling phases	do	Fair	Fair.
Altavista clay loam, eroded rolling phase.	do	do	Poor.

Management requirements.—On soils of this group, including those adequately drained by artificial means, crops should be rotated. Suitable rotations, fertilization, and other management practices are those suggested for soils of group A-2. For soils of group A-3, however, it may be advisable to lengthen the first rotation to 4 years by adding a small-grain crop.

Where snap beans are grown on a commercial basis, they can be substituted for corn in the rotation. The snap beans should be fertilized with 800 to 1,000 pounds an acre of a 4-8-6 mixture. Late crops of beans may be preceded by an early crop of cabbage, which is fertilized with 1,000 pounds an acre of 4-8-6. When beans follow early cabbage the fertilizer application for the beans can be materially reduced.

The control of erosion is important in the management of Altavista clay loam, eroded undulating phase; Warne-Worsham loams, eroded rolling phases; and Altavista clay loam, eroded rolling phase.

SOILS AT LEAST FAIRLY WELL SUITED TO PERMANENT PASTURE

Soils at least fairly well suited to permanent pasture, or Fourth-class soils, are divided into groups B-1 and B-2 according to their management requirements. The soils of the two groups are fairly well suited to pasture, but some are partly or entirely in forest, parts of some have been cropped but are now idle or support a growth of short-leaf pine, and others are used in part for crops.

The management requirements for permanent pasture on soils of these groups include (1) fertilization, (2) liming, (3) regulated grazing, (4) clipping of ungrazed herbage, and (5) scattering of droppings and feed over the land. The use of lime and superphosphate and the seeding of the land with selected mixtures are especially important in management.

GROUP B-1

Group B-1 soils, composed of Alluvial soils, undifferentiated; Spilo-Chewacla silt loams; and Spilo silty clay loam, are in first bottoms and are subject to overflow from the adjacent streams. They are level and nearly level, and drainage generally is poorly established. Stony colluvium (Porters and Hayesville soil materials) is on foot slopes, where it has formed from colluvial and alluvial materials from Porters and Hayesville soils. It is level to moderately sloping, although in some places it is strongly sloping. External drainage is slow to medium, and internal drainage is medium to rapid. The soils of group B-1 are listed in table 13, and the land class, workability, and conservability are given for each soil.

Present management.—Practically all of Alluvial soils, undifferentiated, has never been cleared for crop or pasture use. Cleared areas and areas with a sparse growth of trees are well suited to bluegrass and white clover. Most areas are too far from the present farms to be of use as pasture land.

About 75 percent of Spilo-Chewacla silt loams is cleared land used mainly for hay and pasture of lespedeza mixed with native grasses. Some areas, especially those used for hay, have been limed. Spilo silty clay loam is used to some extent as pasture but much of it is wasteland. The soil has low inherent fertility, but artificially drained

TABLE 13.—*Land class and workability and conservability in relative descriptive terms of soils of management group B-1, Towns County, Ga.*

Soil	Land class	Workability	Conservability
Alluvial soils, undifferentiated.....	Fourth.....	Very poor.....	Very good.
Spilo-Chewacla silt loams.....	do.....	Poor.....	Do.
Spilo silty clay loam.....	do.....	Fair.....	Do.
Stony colluvium (Porters and Hayesville soil materials).	do.....	Very poor.....	Do.

areas that have been heavily limed are well suited to bluegrass and white clover.

About 70 percent of Stony colluvium (Porters and Hayesville soil materials) is forested, mainly with oaks, and the rest is in permanent pasture. Where not too stony, it is well suited to bluegrass and white clover. About 50 percent is too far from the present homesteads to be of any use except for forest.

Management requirements.—Pasture land on the soils of group B-1 should receive 1 to 2 tons an acre of ground limestone in fall and 100 to 200 pounds an acre of triple superphosphate, or its equivalent, the following spring. The land should be seeded to the following pasture mixture: Bluegrass, 6 pounds an acre; orchard grass, 8 pounds; herd's-grass, 5 pounds; alsike clover, 4 pounds; white clover, 2 pounds; and common lespedeza, 5 pounds. The applications of the ground limestone and superphosphate and the pasture mixture are especially suitable for Spilo-Chewacla silt loams and Spilo silty clay loam when these soils have been adequately drained. To reduce acidity and improve soil structure the initial application of ground limestone for Spilo silty clay loam should be 3 tons an acre. An improvement in drainage is necessary in some of the soils of this group.

GROUP B-2

The soils of group B-2 are at least fairly well suited to permanent pasture, although only a comparatively small part of them is in that use. Some areas of the Hayesville, Fannin, Porters, Balfour, and Porters-Balfour soils, and of Hiwassee-Hayesville stony loams, eroded hilly phases, have been used in the past. They were used largely for crops, but the cropping practices, which included clean cultivation, were not beneficial. As a result, accelerated erosion has affected the cropped soils to the extent that pasture is their best use. Fruit, especially apples and grapes, could be grown on a number of them.

All or nearly all of Hayesville loam, hilly phase; Hayesville stony loam, hilly phase; Porters-Balfour loams, hilly phases; Rabun stony clay loam, steep phase; Porters loam, steep phase; and Fannin-Talladega loams, hilly phases, have never been cleared for cropping or grazing. Except in areas too remote from present homesteads, they may be considered as reserves for pasture. The soils of group B-2 are listed in table 14, and the land class, workability, and conservability of each are given.

TABLE 14.—*Land class and workability and conservability in relative descriptive terms of soils of management group B-2, Towns County, Ga.*

Soil	Land class	Workability	Conservability
Hayesville loam, hilly phase	Fourth	Fair	Fair.
Hayesville stony loam, hilly phase	do	Poor	Do.
Porters-Balfour loams, hilly phases	do	Good	Good.
Porters-Balfour clay loams, eroded hilly phases.	do	do	Fair.
Rabun stony clay loam:			
Eroded steep phase	do	Poor	Very poor.
Steep phase	do	do	Poor.
Hayesville clay loam, eroded hilly phase.	do	do	Do.
Hayesville stony clay loam, eroded hilly phase.	do	do	Do.
Porters loam:			
Steep phase	do	Fair	Fair.
Eroded steep phase	do	do	Poor.
Hiwassee-Hayesville stony loams, eroded hilly phases.	do	Poor	Do.
Balfour stony loam, eroded rolling phase.	do	Fair	Fair.
Porters-Balfour stony loams, hilly phases.	do	do	Good.
Porters-Balfour stony clay loams, eroded hilly phases.	do	do	Fair.
Fannin clay loam, eroded hilly phase.	do	Poor	Poor.
Fannin-Talladega loams, hilly phases.	do	Fair	Do.
Hayesville clay loam, severely eroded hilly phase.	do	Poor	Do.

Nearly all of Hayesville loam, hilly phase, is in oak and mixed forest, but if it were needed for pasture, areas could be cleared and seeded to bluegrass, white clover, and lespedeza. Hayesville stony loam, hilly phase, is used as farm woodland and woodland pasture and is better suited to pasture than to crops. About 85 percent of Porters-Balfour loams, hilly phases, is forested, and nearly all the cleared part is pastured. Although it is a suitable soil for pasture, a large part is too far from present homesteads for this use. All of Rabun stony clay loam, steep phase, is forested; the less steep areas could be used for pasture. Porters loam, steep phase, is forested with oak or with oak and pine mixed. Its less steep areas, if favorably located with respect to homesteads, could be used for pasture under proper management practices. Fannin-Talladega loams, hilly phases, now forested, could be cleared and used as pasture land if needed.

The soils of group B-2 that have been cleared or practically cleared of forest and have been under cultivation at one time or another are Porters-Balfour clay loams, eroded hilly phases; Rabun stony clay loam, eroded steep phase; Hayesville clay loam, eroded hilly phase; Hayesville stony clay loam, eroded hilly phase; Porters loam, eroded steep phase; Hiwassee-Hayesville stony loams, eroded hilly phases;

Balfour stony loam, eroded rolling phase; Porters-Balfour stony clay loams, eroded hilly phases; Fannin clay loam, eroded hilly phase; and Hayesville clay loam, severely eroded hilly phase. All of these soils have been materially damaged by erosion, caused to a large extent by growing clean-cultivated crops. A large part of these soils is lying idle or is grown over with shortleaf pine; some areas are used for crops; and some areas are in pasture. Most of the soils could be used for permanent pasture if proper management were practiced. Unless runoff is controlled, they are subject to further loss of material through accelerated erosion.

Present management.—Most farmers do not apply amendments, clip the grass, or seed the land with pasture mixtures in the present management of pasture on soils of group B-2. Only a few farms follow better management practices.

Management requirements.—Soils of group B-2 in good physical condition should receive 1 to 2 tons an acre of ground limestone in fall and 100 to 200 pounds an acre of triple superphosphate, or its equivalent, the following spring. A satisfactory pasture mixture is bluegrass, 6 pounds an acre; orchard grass, 8 pounds; herd's-grass, 5 pounds; alsike clover, 4 pounds; white clover, 2 pounds; and common lespedeza, 5 pounds. The following pasture mixture for soils of low fertility has been recommended (1): Lespedeza, 10 to 15 pounds an acre; herd's-grass, 5 to 6 pounds; and white clover, 2 to 3 pounds. If the soil is low in productivity, lighter applications of superphosphate are more beneficial until better soil structure and a higher content of organic matter have been obtained through the use of ground limestone and leguminous crops.

Sericea lespedeza is excellent for reconditioning Hayesville clay loam, severely eroded hilly phase, and badly eroded areas of other soils of this group. After the lespedeza has improved the soils, they can be seeded to more palatable pasture plants.

Hayesville loam, hilly phase; Hayesville stony loam, hilly phase; Porters-Balfour loams, hilly phases; Porters-Balfour clay loams, eroded hilly phases; Rabun stony clay loam, steep phase; Hayesville clay loam, eroded hilly phase; Hayesville stony clay loam, eroded hilly phase; Porters-Balfour stony loams, hilly phases; Porters-Balfour stony clay loams, eroded hilly phases; Fannin clay loam, eroded hilly phase; and Fannin-Talladega loams, hilly phases, are well suited to the production of apples. Areas of these soils could produce apples commercially if other factors of production were favorable.

The most desirable sites for apple orchards are on long north- and northeast-facing slopes that afford good air drainage. According to the Georgia Agricultural Experiment Station the following varieties of apples are best adapted to the soil and climate of this part of the State: Early Harvest, Red June, Red Astrachan, Horse, Delicious, Kinnard, Stayman Winesap, Yates, and Terry (2). Low-growing summer cover crops, as lespedeza, soybeans, or cowpeas, should be grown on the land while the apple trees are young. Winter cover crops of crimson clover, rye, or vetch should follow to prevent excessive soil erosion and to gather up and conserve the nitrates before they are leached from the soil. Crimson clover and vetch also add to the supply of nitrogen in the soil. An application of 1 pound of 4-8-4 fertilizer

for each young tree and 15 pounds for each large bearing tree is recommended.

Bunch grapes could also be produced on a commercial scale. Soils of group B-2 suitable for growing grapes are the following: Hayesville loam, hilly phase; Hayesville stony loam, hilly phase; Porters-Balfour loams, hilly phases; Porters-Balfour clay loams, eroded hilly phases; Hayesville clay loam, eroded hilly phase; Hayesville stony clay loam, eroded hilly phase; Porters-Balfour stony loams, hilly phases; Porters-Balfour stony clay loams, eroded hilly phases; Fannin clay loam, eroded hilly phase; and Fannin-Talladega loams, hilly phases. The Georgia Agricultural Experiment Station recommends at least 16 varieties of grapes for commercial production (3). Management practices should include the application of barnyard manure, supplemented with 600 to 800 pounds an acre of 4-8-6 fertilizer, and use of cover crops similar to those recommended for apple orchards.

SOILS POORLY SUITED TO CROPS OR PASTURE BUT FAIRLY WELL SUITED TO FOREST

A large part of the county has soils poorly suited to crops or pasture but fairly well suited to forest. Most of the forest is on soils of this group, which includes all the Fifth-class soils in the county. Even though these soils are better suited to forest than to crops or pasture, they differ widely in suitability for the production of forest. For example, Porters stony loam and Rough stony land (Porters soil material) are best suited to forest, but a much better forest may be expected to grow on the Porters soil than on Rough stony land (Porters soil material).

GROUP C-1

The soils of group C-1 are the Hayesville, Porters, Fannin, and Talladega series too steep or too easily eroded to be suitable for cultivation or pasture, Rough stony land (Porters soil material), and Rough gullied land (Hayesville soil material). Drainage is usually excessive, and the acidity is strong to very strong. The soils of this group, together with their land class, workability, and conservability, are given in table 15.

Present management.—Most of the soils in group C-1 are in oak or pine forest. Areas that have been cultivated at one time are now so badly eroded that they are idle or grown over with shortleaf pine.

Management requirements.—The forest supervised by the United States Forest Service is protected from fires and is being developed according to a forest-management plan, by which the timber is cut in 30-year cycles. Forest controlled by individuals should be protected from fires, and pastured areas should not be overgrazed. Wherever possible, forest should be established on badly eroded soils and abandoned fields.

Most of the management practices employed in the production of forest may be grouped as follows: (1) Maintenance of a full stand of species, (2) systematic cutting and weeding of trees, (3) harvesting the mature trees in such a manner that desirable species may succeed them, and (4) the control, so far as possible, of fires, browsing, trampling, damage from the use of harvesting machinery, and damage from other causes. Practices in the first three groups are strictly those of forest management; those in the last group pertain to both soil and forest management.

TABLE 15.—*Land class and workability and conservability in relative descriptive terms of soils of management group C-1, Towns County, Ga.*

Soil	Land class	Workability	Conservability
Hayesville loam, steep phase	Fifth	Fair	Poor.
Hayesville stony loam, steep phase	do	Poor	Do.
Hayesville clay loam, eroded steep phase.	do	do	Do.
Porters stony loam:			
Steep phase	do	Very poor	Fair.
Eroded steep phase	do	do	Poor.
Very steep phase	do	do	Do.
Hayesville stony clay loam, severely eroded hilly phase.	do	do	Very poor.
Fannin clay loam, severely eroded hilly phase.	do	Poor	Do.
Talladega loam, steep phase	do	do	Do.
Hayesville clay loam, severely eroded steep phase.	do	do	Do.
Rough stony land (Porters soil material).	do	Very poor	Do.
Talladega clay loam, severely eroded steep phase.	do	do	Do.
Rough gullied land (Hayesville soil material).	do	do	Do.

ESTIMATED YIELDS

Average acre yields to be expected from various crops on each soil of the county are given in table 16. Because yields vary according to the way the soil and crop are managed, yields for most crops are given for three different kinds of management.

The yields listed in table 16 are based on data obtained from unit-demonstration farmers and other farmers in Towns County, from the county and assistant county agents, from State agricultural workers, and from farmers in Union County, Ga., who live on soils similar to some of those in Towns County. In general, these yields represent the relative ability of the various soils to produce crops under physically defined systems of management. For some crops that are not frequently grown, especially crops on some of the minor soils, the estimates are based largely on crop yields obtained on similar soils under corresponding climatic conditions and management.

The inherent fertility of nearly all the soils of the county is low compared with that of some of the better soils used elsewhere for the production of similar crops. Inasmuch as the general level of productivity of most of the soils is too low for satisfactory yields without amendments, and because the crops produced without amendments are subject to other adverse conditions, the yields given in columns A are less reliable than those given in columns B, which largely represent yields obtained under common management practices.

The natural factors influencing yields are mainly climate, soil, and relief, or lay of the land. In addition to these are the influences of artificial factors, or soil amendments and other management factors.

TABLE 16.—Estimated average acre yields of the principal crops under three levels of management for

Yields in columns A, are those obtained on cleared areas without use of amendments or beneficial crop rotations; those in column B, management practices, including light applications of commercial fertilizer and ground limestone; those in columns C may be including heavy applications of commercial fertilizer and lime, use of winter cover crops, and use of green-manure crops in rotation with snap beans as given only in columns B and C, as these crops are rarely grown without the use of some fertilizer. Ratings for A, B, C and D are for pasture reasonably free of trees; wooded pasture would have lower ratings. A absence of yield data indicates that adaptation

Hiwassee loam:

Eroded rolling phase	18	25	40	8	14	19	8	13	18	.8	1.1	1.7	.3	1.0	1.
Eroded undulating phase	20	28	48	9	16	24	9	14	21	1.0	1.3	1.9	.3	1.1	1.
Undulating phase	23	30	50	10	18	25	10	15	23	1.1	1.3	2.0	.5	1.2	2.
Hiwassee-Hayesville stony loams, eroded hilly phases	8	13	18	4	6	14	4	11	14	.4	.7	1.4	.3	.7	1.
Porters loam:															
Eroded steep phase										.5	.8	1.4			
Slope phase										.6	.9	1.5			
Porters stony loam:															
Eroded steep phase															
Slope phase															
Very steep phase	10	15	20	5	8	15	5	8	15	.5	.9	1.6	.4	1.0	1.
Porters-Balfour loams, hilly phases															
Porters-Balfour clay loams, eroded hilly phases															
Porters-Balfour stony loams, hilly phases	8	13	18	4	6	14	4	6	14	.5	.8	1.5	.3	.9	1.
Porters-Balfour stony clay loams, eroded hilly phases	10	15	20	5	8	15	5	8	15	.5	.9	1.6	.4	1.0	1.
Porters-Balfour stony clay loam:	10	15	20	5	8	14	5	8	14	.5	.8	1.5	.4	1.0	1.
Rabon stony clay loam:															
Eroded rolling phase	20	25	40	8	15	20	8	13	18	.9	1.3	1.9	.5	1.2	1.
Eroded steep phase	13	20	30	6	11	16	6	11	16	.7	1.1	1.9	.4	1.0	1.
Slope phase				6	11	12	6	11	12	.5	1.0	1.7	.4	1.2	2.
Rough grained land (Porters soil material)															
Rough stony land (Porters soil material)															
Shallow silty loam (Porters soil material)	10	15	30	5	6	10	6	9	11	.6	1.0	1.4			
Better drained phase	13	18	33	6	8	11	8	10	13	.7	1.1	1.5			
Spilo-Chevraclia silt loams										.6	.9	1.4			
State silt loam, undulating phase	25	33	50	10	18	25	10	15	23	1.1	1.3	2.0	.6	1.2	2.
Stony colluvium (Porters and Hayesville soil materials)															
Talladega loam, steep phase															
Talladega clay loam, severely eroded steep phase															
Tate silt loam:															
Eroded rolling phase	13	20	35	6	11	15	6	11	15	.8	1.1	1.7	.4	1.1	1.
Undulating phase	15	23	40	8	13	18	8	13	18	.9	1.1	1.8	.5	1.2	1.
Tate-Chewacka silt loams	18	25	45	9	15	20	9	15	20	1.0	1.3	1.9	.4	1.2	1.
Toxaway silt loam:	25	40	60	8	13	18	10	16	21	1.2	1.5	2.1	.7	1.0	2.
Transylvania fine sandy loam	23	35	45	13	16	23	13	16	23	1.2	1.5	2.1	.7	1.4	2.
Tusquitee loam:															
Eroded rolling phase	20	28	48	9	14	24	9	14	21	1.0	1.3	1.9	.3	1.1	1.
Undulating phase	25	33	50	10	18	25	10	15	23	1.1	1.3	2.0	.6	1.2	2.
Tusquitee stony loam, undulating phase	25	35	55	10	18	25	10	15	23	1.1	1.4	2.0	.6	1.2	2.
Wazee-Worsham loams:															
Eroded rolling phases	8	13	25	5	8	10	6	9	15	.5	.8	1.3		.8	1.
Undulating phases	10	15	30	6	9	13	6	11	18	.6	.9	1.5		.8	1.

¹ Cow-acre-days, used to express the carrying capacity of pasture, is the product of the number of animal units carried per acre multiplied by the number of days that animals can be grazed without injury to pasture; for example, a soil that supports 1 animal unit per acre for 360 days rates 360; a soil supporting 1 animal unit on 2 acres for 180 days rates 360.

² Yield of crops and the cow-acre-day unit.

³ Yields are for potatoes grown on b

90; and a soil supporting 1 animal unit, less than 1 mature cow, steer, or horse, 5.

A low yield for a particular crop may be due to some local condition of unfavorable relief, drainage, or climate rather than to lack of soil fertility. Although present knowledge of the management requirements of specific soils for specific crops is limited, some of the deficiencies of the soils are known with a reasonable degree of certainty and others are considered probable. From this knowledge, some of the requirements for soil management are treated in the section on Soils under the discussion of the soil units and in the section on Land Use and Soil Management.

Just as the requirements of different crops on the same soil are different, so also may be the requirements of the same crops on different soils. Moreover, the point at which it is no longer profitable for a farmer further to intensify the better practices of management depends not only on the soil and the crop but also on the other soils and other crops of the farm, the combination of farm enterprises, prices, and numerous other considerations.

The yields given in columns C are intended as production goals that might be generally reached by using the better management practices. For any one soil and crop, the same goal can probably be reached by several different combinations of the management practices. Some of these practices may supplement or replace others, but some are essential to good management. The best choice depends on the farm business as a whole. On one farm it may be practicable to manage the soil in such a way that the yields exceed the goal, but on others it may not be practicable to reach it. The best practical management for a farm unit may give yields in excess of the goal for one crop and soil and yields below the goal for another crop on the same soil.

The yields listed in columns C give some idea of the responses that may be expected under good management, as they can be compared with the yields listed in columns A and B. Yields in columns C were estimated at the time of survey, however, and considerable progress in soil management has been made since that time. To reflect 1951 status, some crop yields in columns C of table 16 should be doubled, and pasture yields at least tripled. In 1950, out of 480 farmers in the 100-Bushel Corn Club of Georgia, 56 were from Towns County, and they had the highest average yields. The average for the entire Club was 119 bushels an acre.

WATER CONTROL ON THE LAND

Water control on the land includes such practices as regulation of runoff, protection from floods, drainage, and irrigation that will maintain favorable soil-moisture conditions for plant growth.

At the present time irrigation, protection of land from floods, and drainage are of little importance in the county. Irrigation would doubtless increase production of crops on many soils in dry seasons and its use to supplement rainfall might prove economically feasible on gardens and small tracts of truck crops or other valuable crops. Although considerable damage has resulted from overflow of streams, most floods occur early in spring before crops have been planted and are not so serious as on lands farther from the sources of the streams than those in Towns County. Ditches have been used to drain some

poorly drained soils, but little tiling has been done. Artificial drainage is a minor problem on most farms.

The maintenance of favorable soil-moisture conditions for plants through the regulation of runoff is the major problem in the control of water on the land in this county. Runoff is too rapid on many soils to permit absorption of sufficient moisture. As a result there is a loss of water, sometimes accompanied by a loss of soil material. The loss of soil material is the most apparent because it leaves the soil in an eroded condition. The soils subject to erosion can be improved by regulating the runoff so that more moisture can be absorbed for plant use.

In the Tennessee River Valley, of which Towns County is a part, a series of dams has been constructed to control and use the water in the streams for the public good. The dams make possible navigable waterways, decrease floods by regulating the volume of flow, and provide a head of water for the generation of electricity. Their effectiveness depends to a large extent on their capacity to regulate the volume of flow in the large streams. Most of the streams of this county feed the main river system, and any measures that regulate the flow of water from the land they drain have a bearing on the effectiveness of the entire system of dams. Moreover, the principal means of controlling floods on these feeder streams is through the control of water on the land where it falls.

Water is a natural resource to be utilized on the land as well as in the streams. Even though Towns County is situated in a region of high rainfall, lack of water is commonly a limiting factor in the growth of plants during certain periods of the year. Any measures that bring about a more nearly adequate and even supply of water during the growing season will promote increased production of the plants on which the people depend for their livelihood. Other factors of crop production, as an adequate supply of mineral plant nutrients in the soil, retention of a sufficient quantity of water for the needs of the plants, a favorable physical condition in the soil for the development of plant roots, and the control of plant diseases and destructive insects, may limit the effective use of water by plants.

There is a direct relation between the density of vegetation and its ability to condition the soil so that it will absorb and retain water and decrease the rate and volume of runoff. In addition, the vegetative cover, its debris, and its root system materially reduce soil loss by impeding runoff and by binding together the soil particles. Forests are effective in reducing the loss of water and soil; and sod-forming crops, as hay, pasture grasses, and some legumes, are also effective. Close-growing crops, as small grains, are somewhat less effective than sod-forming crops, and intertilled crops are generally the least effective.

Several soil characteristics—slope, consistence, texture, and depth to bedrock—also have direct bearing on the problem of runoff control. Of these, slope is of outstanding importance. Other soil characteristics being similar, soils with steep slopes are most susceptible to erosion and their suitability for agricultural use is the most restricted. Soils with moderate slopes or those nearly level are least susceptible to damage caused by runoff and their suitability for agricultural use is restricted the least.

In general, soil use and crop rotations should be so adjusted that the soils will be protected from erosion by a vegetative cover. This cover should be determined by the quantity and rapidity of runoff as well as by the physical characteristics of the soil. On cropland and pasture the vegetative cover should be vigorous in growth. The use of lime, manure, and fertilizer in suitable quantities and the use of legumes in the crop rotations will help. Agricultural lime supplies the plant nutrient calcium and adjusts the acidity of the soil. Manure supplies nitrogen, potash, and organic matter and aids in keeping the soil in good physical condition. Mineral fertilizers supply nitrogen, phosphorus, and potash, and they may be used to supply minor nutrient elements as well. If properly inoculated, legumes fix nitrogen obtained from the air. Their roots add organic matter to the soil and thus aid in maintaining the soil in good physical condition.

The soil should be so tilled that it will retard runoff and absorb water. It should be tilled at such time and in such manner as to be bare of vegetation for as brief a period as possible. Contour tillage is desirable on many slopes, as it impedes runoff. Contour strip cropping may be desirable on the steeper slopes; it is generally most feasible and most desirable on long slopes.

Engineering methods, as terracing, for the control of runoff are expensive. Terraces seem to lower the productivity of many soils and they must be maintained in good condition to be effective. Poorly kept terraces may be worse than none. Terraces have a place in the control of runoff under certain conditions, but they should be used only when other soil management methods are inadequate.

Because practices for the control of water depend not on the soil alone but on other conditions affecting the farm unit as well, each farmer should choose the combination of practices that his farm unit requires. The combination of practices he selects should provide, as nearly as his operating enterprise will permit, the maximum control of water on the land. Effective control of water is obtained on many farms in the county and can be obtained on many more by using soil management practices ordinarily considered sound from the standpoint of efficient crop production. Water control can be accomplished largely by good farming practices, including proper choice and rotation of crops, proper fertilization and tillage, control of plant diseases and destructive insects, and in some places, engineering practices.

MORPHOLOGY AND GENESIS OF SOILS

Soil is the product of soil-forming processes acting on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by: (1) The physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life in and on the soil; (4) relief, or lay of the land; and (5) the length of time the forces of soil development have acted on the parent material.

FACTORS OF SOIL FORMATION

Climate and vegetation change the parent material from an inert heterogeneous mass to a body having more or less definite genetic

morphology. The action of climate and vegetation on the parent material is aided or hindered to varying degrees by the relief. To some extent, relief determines runoff, the movement of water through the soil, natural erosion, and the natural vegetation. The character of the parent material modifies the influence of climate and vegetation in soil formation and is important in determining the internal character of the soil and the kinds of natural vegetation. Throughout the genesis of soil, time brings about changes; hence, age is a factor in the development of the soil into a body in equilibrium with its environment. The degree of soil development depends not only on time but also on the rate at which forces of climate and vegetation act, which, in turn, are regulated by the character of the relief and parent material.

Based on the source, the parent material of the soils of the county belong to two classes: (1) Residual material derived from the decomposition of rock in place; and (2) transported material or material removed from its original position and deposited on valley uplands and near streams. The first class consists of soil material developed in place through the weathering of parent rock. The second class consists of rock fragments and other rock waste and soil material moved by gravity and water from the uplands and deposited at the foot of slopes and of alluvial material derived from the uplands and deposited near streams by running water. The material of the first class is generally related directly to the underlying rocks, and the material of the second class, to the soils or rocks from which it was removed.

Igneous and metamorphic rocks have given rise to the parent material. These rocks differ somewhat in chemical and mineralogical composition, and the parent materials derived from them differ likewise. Sufficient study has not been made to permit comparison of differences in the mineralogical and chemical composition of the various kinds of rock with differences in the resultant soils. The differences in most soils developed in place on residual material from rocks can be attributed to differences in the mineral composition of the rocks from which the residual materials are derived. Where the same kind of rock underlies different kinds of soil, however, the differences in the soils are the result of other causes.

Although some characteristics of the soils can be correlated with the kinds of parent material, others, especially those of regional significance to soil genesis, are due to other factors.

The climate in the valleys of the county is characterized by long moderately warm summers, short mild winters, and moderately high rainfall. Chemical reaction is rapid as a result of moderately warm weather and moist soil. Heavy rainfall has caused the leaching of soluble materials, as bases, from the soil and caused the downward movement of less soluble materials and colloidal matter. The soil is frozen for only short periods and to shallow depths, and such condition intensifies the action of weathering and the translocation within the soil of insoluble materials.

The climate in the mountains is characterized by somewhat lower temperatures than that of the valleys, and chemical reaction in the soil is more retarded. The rainfall in the mountains is high, and soluble materials are leached from the soil and less soluble materials

and colloidal matter are carried downward in the soil. As the soil is frozen for longer periods and to greater depths than in the valleys, leaching is less active.

Generally the climatic conditions in the valleys give rise to Red and Yellow Podzolic soils, whereas those in the mountains give rise to Gray-Brown Podzolic soils. Nonetheless, all gradations between soils of these two groups occur.

Within any climatic zone certain outstanding characteristics are common to the well-drained, well-developed soils, but the soils differ in other characteristics that may be due to factors other than climate. The character of the parent material seems to have been an outstanding cause in bringing about the differences. A large part of the county has climate marginal between the climate characteristic of the Red and Yellow Podzolic region and that of the Gray-Brown Podzolic region. Consequently, Red Podzolic, Yellow Podzolic, and Gray-Brown Podzolic soils are closely associated, and differences caused by parent material, drainage, and age are important in determining the great soil group to which many of the soils belong.

Higher plants, micro-organisms, earthworms, and other forms of life exist on and in the soil and contribute to its morphology. The nature of the changes brought about by these depends, among other things, on the kinds of life and the life processes of each. The kinds of plants and animals are determined by climate and by many other factors of the environment. Climate is the most apparent but not the most important factor determining the kinds of higher plants that grow on the well-developed well-drained soils, and in this indirect way it influences greatly the morphology of the soils. Hence, climate and vegetation together constitute the active factors of soil genesis.

A forest consisting largely of deciduous trees and an undergrowth of bushes, various shrubs, and smaller plants originally covered the territory in which Towns County is situated. Practically all the original forest has been removed for timber, and the present-day forest consists of second-growth trees, some original trees, and an understory of various plants. Many of the present trees are moderately deep feeders and shed their leaves annually. Although the content of plant nutrients in the leaves ranges considerably, the quantity of bases and phosphorus returned to the soil is generally higher than the quantity returned by the leaves of conifers. Essential plant nutrients are thus restored to the upper part of the soil from the lower part, and the depletion of bases from the soil is retarded.

The organic matter accumulated in the upper part of the soil through the decay of leaves, twigs, roots, and some entire plants is acted on by micro-organisms, earthworms, and other life and undergoes direct chemical changes. Organic material seems to decompose more slowly on the mountains than in the valleys, and as a result, some soils on the higher mountains accumulate more organic matter than comparable ones in the valleys. This greater accumulation somewhat counterbalances the effects of rapid rock weathering and soil leaching.

The relief of the county, ranging from nearly level in first bottoms near streams to very steep in the mountains, modifies the effects of climate and vegetation. On some steep slopes runoff of rain water is great; hence, geologic erosion is rapid and keeps almost even pace with rock weathering and soil formation. Because material for soil for-

mation is constantly being removed from these steep slopes by water or is being mixed by local slides, enough of it rarely remains in place a sufficient time for a profile of genetically related horizons to be formed. Only small quantities of water percolate through the soil in such steep areas, and leaching and translocation of insoluble materials downward in the soil are correspondingly inactive. The stands of vegetation are generally thinner than on soils having better moisture relations. In many places soil on the concave slopes has a more nearly complete profile development than soil on convex slopes. Geologic erosion is apparently slower on the concave than the convex slopes, and moisture relations are more conducive to the growth of dense stands of vegetation.

Soil material that has been in place for a short time, as that on the first bottoms along streams, has been altered very little by climate and vegetation, and a well-defined soil profile of genetically related horizons has not formed. Soil material on steep slopes is replenished by rock weathering as the soil cover is removed by geologic erosion, and little opportunity is afforded for the formation of the genetic soil profile. These two broad classes of soil comprise the young or very young soils.

Soil material that has been in place for a long time will, under favorable conditions of relief and other factors of soil genesis, develop into a soil. When this soil has reached approximate equilibrium with the environment, it is considered to be mature, or old. The soils of the county range in age from very young to very old, but over a very large part they are young and old.

CLASSIFICATION OF SOILS

Soils are classified on the basis of characteristics that will enable one to remember them and their relations. They may be classified according to their need of lime, their ease of tillage, or their productivity, but such classifications are seldom suitable for another use and are made only to aid in special problems involving certain soils. This section deals with the natural classification of soils, or that based on the characteristics of the soils, and is presented in order that the soils may be remembered through their characteristics and that solutions to problems concerning them may be facilitated.

In soil classification the simplest unit is the soil phase, which has the narrowest range in all observable characteristics, both external and internal. It is the unit concerning which the greatest number and most precise statements can be made.

A soil type has a somewhat wider range in characteristics than the phase. Unless there is only one phase of the type, fewer and less specific statements can be made about the type than about the phases in that type.

Soil types having layers, or horizons, similar in such characteristics as color, thickness, and arrangement but different in texture of the surface layer and associated characteristics, as consistence, are grouped in series. In general, differences in the texture of soil types belonging to the same series are reflected in all the layers of the profile, but the types are defined in terms of the texture of the surface layers. Fewer and less specific statements can be made regarding the soil series as a

whole than regarding any of its types, unless there is only one soil type in the series.

In the following pages the soil series are presented according to great soil groups—Red Podzolic, Yellow Podzolic, Gray-Brown Podzolic, Planosols, Alluvial, and Lithosols—and detailed descriptions of representative profiles are given. The soil series are listed in table 17, and for each are given the order, great soil group, relief, internal drainage, parent material, and soil age.

ZONAL SOILS

Zonal soils belong to any one of the great groups of soils having well-developed soil characteristics that reflect the influence of the active factors of soil genesis—climate and living organisms, chiefly vegetation (18). Zonal soils in Towns County are members of the Red Podzolic, Yellow Podzolic, and Gray-Brown Podzolic great soil groups.

Towns County is situated near the southeastern limits of the Gray-Brown Podzolic soils region, where the soils of that region merge with the Red Podzolic soils and Yellow Podzolic soils region.¹² Soils characteristic of both regions are developed in the county. In their typical environment the soils of these two regions have sharply contrasting characteristics, but in the geographic location of Towns County, the widely divergent profile characteristics that distinguish these great soil groups are as a whole not generally well expressed. Rather, in some places, the characteristics of soils of the Gray-Brown Podzolic great soil group blend with those of some of the most representative soils of the Red Podzolic great soil group. In other places the regional characteristics of the Gray-Brown Podzolic soils are better expressed.

The Gray-Brown Podzolic soils have a thin surface covering of leaf litter underlain by a crumb-structured loamy layer, or A₁ layer, which is slightly darkened by well-decomposed mild humus that is thoroughly mixed with the mineral soil. The A₂ layer is light grayish brown or grayish yellow. It is not so strongly leached as the A₂ layer in well-developed podzol profiles. The subsoil, or B horizon, is yellowish brown, brown, or reddish brown, becoming lighter in color with depth. It is heavier textured than the surface layer, or A horizon, has a nut structure, and is otherwise a well-developed illuvial horizon. Below the subsoil there may or may not be a layer of parent material, or C horizon, differing from the underlying D horizon. The depth of the solum to the parent material rarely exceeds 4 feet.

The Gray-Brown Podzolic soils are developed under an average summer temperature of 73° F., and an average winter temperature of 32°, except east of the Appalachian Mountains, where winter temperatures are a little higher, or about 35°. The humid climate is characterized by warm summers, cold winters, and an average annual rainfall of about 40 inches. The natural vegetation consists for the most part of mixed deciduous trees, chiefly oak.

Although Red Podzolic soils are developed in Towns County, some of the most representative Red Podzolic soils are developed on the

¹² The soils have been grouped according to the classification outlined by Baldwin, Kellogg, and Thorp (18) and by Marbut (10).

Piedmont Plateau under oak-pine forests. Summer temperatures range from 2 to 7 degrees higher and winter temperatures from 8 to 15 degrees higher than they do in corresponding seasons in the region of the Gray-Brown Podzolic soils. The average rainfall is also a little higher. In comparing the profiles of soils of these two great soil groups, those of the Red Podzolic group have a more highly eluviated A horizon and a sharper demarcation between the A and B horizons than do the Gray-Brown Podzolic soils. The B horizons are better developed and are generally underlain by a thicker layer of parent material. In soils of comparable texture the content of alkaline earths, alkalies, and silicate silica is lower and the content of iron and alumina is higher. The chemical composition of the mineral colloids in all horizons do not vary so greatly in the Red Podzolic soils (5, 7).

RED PODZOLIC SOILS

Red Podzolic soils are a zonal group of soils having thin organic and mineral-organic layers over a yellowish-brown leached layer that rests on an illuvial red layer. They are developed under deciduous or mixed forest in a warm-temperate climate. The processes by which these soils are formed are podzolization and laterization (13).

The Red Podzolic soils in this county belong to the Hayesville, Fannin, Rabun, Hiwassee, and Talladega series. Soils of the Hayesville, Fannin, Rabun, and Hiwassee series have characteristics common to Red Podzolic soils and have apparently developed under relatively similar climate and vegetation. The Talladega series is regarded as lithosolic because of the weak development of its texture profile and its close relation to the parent rock.

The Red Podzolic soils of this county are well drained; and although the degree of maturity ranges somewhat, they have at least a moderately well-developed Red Podzolic profile. The relief ranges from gently undulating or very gently sloping to very strongly sloping and steep, some members of the Hayesville, Talladega, and Rabun series having the steepest relief. Differences among these soils, however, cannot be accounted for altogether by differences in relief. Relatively marked differences exist in the composition of the parent material, which may be chiefly the direct or indirect cause of the differences among the soils. Except for the Rabun (on mountain ridges and slopes) and the Talladega (on mountains and foothills), these soils are in the lower lying parts of the county and are on rolling to steep intermountain uplands or very gently sloping to very strongly sloping terraces that lie high above the streams. The Fannin, Hayesville, and Hiwassee soils are in the warmest parts of the county.

All of the Red Podzolic soils have formed from rock materials that generally have a greater content of bases or have been in place for a longer time than the parent materials of the Gray-Brown Podzolic soils at similar elevations. The Red Podzolic soils have better internal drainage than the Yellow Podzolic soils, with which they are closely associated.

Hayesville Series

Compared with soils of the Porters series, which lie at relatively high elevations on mountains and belong to the Gray-Brown Podzolic great soil group, Hayesville soils are typically developed at lower

TABLE 17.—Classification of the soil series of Towns County, Ga., by soil orders and great contributors to soil morphology

ZONAL Soils

Great soil group and series	Relief	Internal drainage ¹	Paren
Red Podzolic: Hayesville.....	Gently undulating to steep-	Medium.....	Eluvium consisting of Weathered granite-gneiss
Fannin.....	Gently undulating to hilly-	do.....	Weathered granite-gneiss
Rabun.....	Gently undulating to steep-	do.....	Weathered granite-gneiss
Talladega (lithosolic). Fivassiee.....	Hilly and steep..... Very gently sloping to very strongly sloping.	do..... do.....	Alluvial material uplands unconsolidated granite-gneiss
Yellow Podzolic: Worsham (lithosolic) Altavista.....	Gently undulating to rolling- Level to strongly sloping.....	Slow to very slow..... Slow.....	Weathered granite-gneiss Alluvial material uplands unconsolidated granite-gneiss
Gray-Brown Podzolic: Balfour..... Porters (lithosolic).....	Gently rolling to hilly..... Hilly to very steep.....	Medium..... do.....	Coluvium and consisting of Materials derived underlain gneiss.
Tusquitee.....	Level to very strongly sloping.	do.....	Materials derived underlain and granite-gneiss
Tate.....	do.....	do.....	Alluvial material uplands unconsolidated gneiss and schist
State.....	Level to gently sloping.....	do.....	
INTRAZONAL Soils			
Planosols: Warne.....	Very gently sloping strongly sloping.	to	Alluvium consisting of Materials derived underlain and schist

			Materials d underlain and gran-
Spilo-----	Level and nearly level-----	Very slow to slow -----	
			Alluvium con- Materials d underlain gneiss, an- dito a le- subbasic
Alluvial soils: Congaree-----	Level and nearly level-----	Medium-----	Materials d underlain and mica- schist.
Transylvania-----	do-----	do-----	Materials d underlain and micas-
Chewacla-----	do-----	Slow to very slow -----	Alluvium con- Materials d underlain and mica- schist.
Toxaway ³ -----	do-----	Slow-----	Coluvial and derived from lain mainly Alluvial mate- uplands un- granite-gneis- schist.
Lithosols: Rough gullied land (Hayes- ville soil material). Rough stony land (Porters soil material). Stony colluvium (Porters and Hayesville soil mate- rials). Alluvial soils, undifferen- tiated.	Gently rolling to steep ----- Very steep----- Level to strongly sloping----- Level and nearly level-----	Medium----- do----- Medium to rapid----- Medium to slow-----	Weathered gra- do----- do----- do----- do----- A very young soil has few if a normal soil. ³ Age refers to the degree to which a given soil has developed the properties characteristic of a mature soil developed in a similar environment. A mature soil has reached a state of equilibrium with its environment. The terms used to designate age are relative.

1 Medium internal drainage is optimum for the development of a normal soil.
 2 Age refers to the degree to which a given soil has developed the properties characteristic of a mature soil developed in a similar environment. A mature soil has reached a state of equilibrium with its environment. The terms used to designate age are relative.

³ With glei subsoil.

elevations and on the smoother relief of the Hiwassee Plateau where parent material has remained in place a sufficient time for the development of a normal soil profile (pl. 3, C).

The parent materials of both the Hayesville and Porters soils are derived from granite-gneiss of similar composition. The Hayesville soils have developed under warmer average temperature and a lower average annual rainfall of about 50 inches. They are friable but not so crumbly as the Porters soils, and their A₁ layer contains less organic matter. Their A horizon is loamy and similar in texture to the A horizon of Porters soils, but it is more leached and more sharply differentiated from the B horizon than is the A horizon of the Porters. The B horizon is red friable clay loam, whereas that of the Porters soils is yellowish-brown, moderate-brown, or slightly reddish-brown soft crumbly clay loam.

Below the B horizon in Hayesville soils is a thick layer of red, or in some places reticulated red, yellow, and gray, thoroughly weathered parent material that extends to a depth of 5 to 8 feet. A few small quartz particles and flakes of muscovite are the only remaining evidence of the mineral composition of the original rocks.

In the Porters series a thin layer of parent material is present in most places. This layer generally consists of incompletely oxidized yellowish-brown or light-brown gritty clay loam, in which small subangular quartz particles and subrounded feldspar particles indicate disintegration of the rocks into the various mineral components. Only partial decomposition of the minerals themselves, including the less resistant feldspar and biotite, has taken place.

A profile of Hayesville loam, rolling phase, on a northwest-facing slope of 10 percent 2½ miles north of Young Harris has characteristics as follows:

- A₀. 0 to ½ inch, leaves from oak and other deciduous trees.
- A₀. ½ to 1 inch, horizon generally less well developed than corresponding one in Porters soils; consists of very dark-brown decayed organic matter held together by various fungi mycelia and small roots; some worm and insect activity.
- A₁. 1 to 2 inches, dark grayish-brown loose fluffy loam containing a moderate quantity of well-decomposed organic matter.
- A₂. 2 to 10 inches, light-brown friable gritty loam having a slightly reddish-brown color and a crumbly consistency when moist.
- B₁. 10 to 14 inches, red gritty clay loam; material loose and slightly granular when dry but friable and moderately crumbly when moist.
- B₂. 14 to 34 inches, red heavy clay loam containing a few mica flakes; easily crushed into coarse crumblike particles; freely penetrated by large roots of trees; small roots less numerous than in the layer above.
- B₃. 34 to 38 inches, red slightly micaceous clay loam somewhat lighter than the clay loam in layer above; material is soft and crushes into medium crumbs under moderate pressure.
- C₁. 38 to 62 inches, red soft gritty clay loam containing many small angular quartz particles; somewhat more micaceous than horizons B₁ and B₂.
- C₂. 62 to 74 inches, yellowish-red soft gritty clay loam containing a moderate quantity of mica flakes and highly weathered fragments of granite-gneiss; nearly all the mica is muscovite.
- D. 74 inches +, parent rock of granite-gneiss mixed with some micaceous schist.

The C₂ horizon has weathered to a depth of 6 to 30 feet or more, but in most places to a depth of 6 to 15 feet. The parent rock is predominantly granite-gneiss that contains variable quantities of mica-

ceous schist. Where it consists largely of micaceous schist and the mica content is high, the parent rock resembles that in the profile of the Fannin series.

The granite-gneiss that underlies Hayesville loam, hilly phase, has a high content of light-gray or pinkish feldspar, moderate quantities of quartz and biotite, and a low muscovite content. The narrow quartz veins reach nearly to the surface layer of the soil and have weathered very little. In most places the granite-gneiss has weathered to a depth of 10 feet or more, but the weathering of the different minerals in the rock has been unequal. The feldspar and biotite have been weathered to various degrees throughout the zone of weathering.

Fannin Series

On the smoother areas of the Hiwassee Plateau where the surface rocks are mica schist instead of granite-gneiss, the soil that has developed belongs to the Fannin series rather than the Hayesville. The slight differences between these series are the direct result of differences in the composition of the parent materials. The soils of each series have a leached A horizon and a red well-developed B horizon, but the B horizon of the Fannin soils, compared to that of the Hayesville soils, has a higher mica content, a slick greasy feel, and a dense slightly compact consistence. Only a thin layer of red weathered rock material lies between the B horizon and the mica schist bedrock, and in places the B horizon is relatively shallow over the weathered rock. In the normal Fannin profile, the B horizon overlies the weathered rock at a depth of 36 to 60 inches; in the normal profile of the Hayesville soil it overlies the weathered rock at a depth of 60 to 96 inches.

Rabun Series

The Rabun soils have well-developed Red Podzolic profiles and have formed on gently undulating to hilly mountain ridges and fairly steep mountain slopes from residual material of dark-colored basic igneous rocks. They are characterized by a dark-brown or reddish-brown friable surface layer and by a red firm but brittle silty clay subsoil. Their red color is probably due to the basic minerals that compose the parent rock. These soils developed under a forest of deciduous trees and in a climate characteristic of the cooler parts of the region of the Red Podzolic soils.

Talladega Series

The soils of the Talladega series are mainly on hilly and steep relief in mountainous areas. They have formed from weathered material of highly micaceous schist (pl. 4, A), and platy fragments of muscovite mica are on the surface and throughout the profile. The soils developed under a forest of deciduous trees and in a moderately cool moist climate similar to that in which the Porters soils of the Gray-Brown Podzolic great soil group developed. They are shallower to bedrock than the Fannin soils and have weakly developed profiles.

The soils of the Talladega series have a reddish-brown, light-brown, or yellowish-red surface layer and a red, light-red, or reddish-yellow

subsoil. The mica flakes in the profile give the soil a shiny appearance and a slick greasy feel. The soils nearly everywhere are shallow to the weathered parent rock.

Owing to their close relation to the parent rock, the Talladega soils have been designated lithosolic in contradistinction to the well-developed Red Podzolic soils of the Fannin series, which are derived from similar parent material.

Hiwassee Series

The Hiwassee series is composed of medium Red Podzolic soils developed from old alluvial material that was derived from uplands underlain by granite-gneiss, schist, and other igneous and metamorphic rocks. They have developed under a forest of deciduous trees and in a warm moist climate characteristic of the cooler parts of the Red Podzolic soil region. They have good drainage, occur on very gently sloping to very strongly sloping parts of smooth terrace land near large streams, and are characterized by a dark-brown or very dark-brown surface layer and by a red fine-textured subsoil. Their relief was favorable to the development of a mature soil, and they are the most mature of any of the soils on stream terraces in the county.

The soils of this series occupy positions on higher terraces than the Yellow Podzolic Altavista soils and are apparently older in degree of development. Possibly differences in the composition of the parent materials of the Hiwassee and Altavista soils have caused the development of red and yellow soils, respectively.

Although the Hiwassee soils closely resemble the Hayesville soils in profile characteristics, they differ in character of parent material. The alluvium from which Hiwassee soils formed has evidently been in place for a long period of time. In most places the material has weathered to a depth of about 6 feet, but weathering may continue to 10 or 15 feet.

In forested areas Hiwassee loam, undulating phase, has the following profile:

- A₁. 0 to 2 inches, dark grayish-brown friable crumbly loam; high organic-matter content.
- A₂. 2 to 9 inches, dark reddish-brown friable crumbly loam containing a large quantity of decomposed organic matter well combined with the mineral matter.
- B₁. 9 to 24 inches, dark-red soft crumbly clay loam in which there are a few dark-gray soft manganese concretions.
- B₂. 24 to 40 inches, dark-red soft crumbly clay loam slightly lighter than that in the horizon above.
- C₁. 40 to 60 inches, red soft highly micaceous clay loam.
- C₂. 60 to 120 inches, stratum composed of yellow or greenish-yellow micaceous sandy loam, well-rounded quartzite gravel, and larger water-worn quartzite fragments. In most places this stratum is 24 to 48 inches thick and overlies weathered granite-gneiss or schist rock.

YELLOW PODZOLIC SOILS

Yellow Podzolic soils are zonal soils having thin organic layers and organic-mineral layers over a grayish-yellow leached layer that rests on a yellow horizon. They are developed under coniferous or mixed forest in a warm-temperate moist climate. The soil-development processes are podzolization and some laterization (13). Members of

the Worsham and Altavista series belong to this great soil group; the Worsham soils are considered lithosolic because they are closely related to the parent rock.

The Yellow Podzolic soils are associated geographically with Red Podzolic soils and have developed under similar climate, relief, and vegetation. Although the parent materials are similar in character, that of the Yellow Podzolic soils generally has been in place for a shorter time. The restricted drainage may be partly the cause of the yellow color of the soils. The cause of the differences between Yellow Podzolic soils and Red Podzolic soils, however, is not fully understood.

Worsham Series

The soils of the Worsham series, occupying relatively small areas at the base of slopes bordering streams, have formed from residual material of weathered granite-gneiss. In places colluvial and local alluvial materials possibly have contributed to their formation. The relief ranges from gently undulating to rolling. External drainage is slow to rapid and internal drainage is slow to very slow. In this county the Worsham soils are so intricately associated with the Warne soils, classified as Planosols, that they are mapped only in complex with them.

The Worsham soils are characterized by a light-gray or medium-gray surface layer and a brownish-yellow or moderate-yellow subsoil. Beneath the subsoil is a gray layer containing a large quantity of mica flakes.

Altavista Series

The soils of the Altavista series have developed on comparatively low to low terraces near streams from alluvium composed of material derived from soils on the uplands that are underlain by igneous and metamorphic rocks. They have a grayish-yellow surface layer and a pale-yellow or moderate-yellow fairly compact subsoil. The relief ranges from level to strongly sloping, and the internal drainage is slow. These soils occupy narrow to fairly wide areas and are associated with Hiwassee soils on high terraces, State soils on low terraces or high first bottoms, and Congaree and other soils in first bottoms.

The Altavista soils are derived from the same kind of alluvium as that giving rise to the Hiwassee and State soils and have developed under similar vegetation and on similar relief. They are younger than the Hiwassee soils but older than the State soils and may be at an intermediate stage in the development of a Red Podzolic soil. The material from which they have developed is more acid than the parent material of the Hiwassee soils. The yellow color of the profile may be due in part to the restricted internal drainage.

Forested areas of Altavista loam, undulating phase, have the following profile characteristics:

- A₁. 0 to 2 inches, dark-gray friable light loam; moderately high organic-matter content.
- A₂. 2 to 8 inches, medium-gray or slightly grayish-yellow loose gritty loam; light gray when dry; low organic-matter content; very much leached.
- B₁. 8 to 13 inches, grayish-yellow gritty clay loam; stiff and moderately plastic when moist and moderately compact when dry.

- B₂. 13 to 26 inches, moderate-yellow heavy clay loam; stiff but easily pressed in short ribbons when moist and compact and difficult to break when dry.
- B₃. 26 to 34 inches, pale-yellow clay loam that has a few light-gray mottlings near the bottom of the layer; lower clay content and slightly less stiff or compact than horizon B₂.
- C₁. 34 to 50 inches, mottled light-gray and moderate-yellow stiff compact slightly micaceous sandy clay; lower clay content than the horizon above.
- C₂. 50 to 72 inches, light-gray somewhat crumbly sandy clay containing an appreciable quantity of coarse sand; some moderate-yellow stains; less stiff and compact than the sandy clay of horizon C₁.

Generally at a depth of 60 to 84 inches the parent material of this phase is underlain by a stratum of white rounded quartzite gravel and larger waterworn quartzite fragments.

An undulating low terrace phase of Altavista loam is developed in areas only slightly elevated above the adjoining first bottoms. Its upper subsoil is not so fine-textured as in the undulating phase of the loam, and the lower part is mottled dusky yellow and gray. There are some indications of gleization.

GRAY-BROWN PODZOLIC SOILS

The Gray-Brown Podzolic soils are a group of zonal soils having a comparatively thin organic covering and organic-mineral layers over a grayish-brown leached layer that rests on an alluvial brown layer. They have developed under deciduous forest in a temperate moist climate. Podzolization is the dominant process in their development (13).

Members of this group—soils of the Balfour, Porters, Tusquitee, Tate, and State series—lie at high elevations where the climate is cooler than in most places at similar latitudes. Although Gray-Brown Podzolic soils generally occupy higher positions than the Red Podzolic soils, the two groups are developed side by side in some places. In nearly all places where they are closely associated, the Gray-Brown Podzolic soils either are derived from materials lower in content of bases or are younger than the Red Podzolic soils. Both groups have developed under similar conditions of relief and vegetation, and both are well drained.

Differences among the Gray-Brown Podzolic soils are the result of differences in parent material or in relief. The soils of the Porters series are classified as lithosolic because of their weakly developed texture profiles and close relation to the parent rocks. The soils of the Balfour series may be considered well-developed Porters soils.

Balfour Series

Balfour soils have gently rolling and rolling relief and have formed from weathered products of granite-gneiss. They occur at comparatively high elevations on the tops of ridges and on lower slopes of mountains. They developed under a forest cover of deciduous trees and in a cool moist climate similar to that prevailing at high latitudes in the Gray-Brown Podzolic region. The surface layer is brown and mellow, and the subsoil is brown to reddish brown, friable, and porous.

Balfour soils developed in the same kind of climatic and vegetative environment and from the same kind of parent material as the Porters soils. Their milder relief, however, means more water absorption and less runoff, geologic erosion, and mixing of materials than occurs on the steep relief of the Porters soils. As a result, the Balfour soils have the well-developed Gray-Brown Podzolic profile instead of the weakly developed profile of the Porters soils.

The following profile description is that of Balfour stony loam in the complex of Porters-Balfour stony loams, hilly phases, on a 16-percent north-facing slope at Jacks Gap in the southeastern part of the county:

- A₀₀. About $\frac{1}{2}$ inch of freshly fallen leaves, mainly oak but some from chestnut, dogwood, and other deciduous trees.
- A₀. About 1 inch of very dark-brown decayed organic matter held together loosely by fungi mycelia and by small fibrous roots.
- A₁. 0 to 1 inch, dark grayish-brown soft crumbly silt loam; high content of thoroughly decomposed organic matter well incorporated with the mineral material; loose; many channels made by roots and earthworms.
- A₂. 1 to 9 inches, light-brown or slightly grayish-brown loose crumbly gritty loam, slightly coarser textured than the horizon above; comparatively low organic-matter content; color changes only a little as depth increases but the clay content becomes somewhat greater.
- B₁. 9 to 13 inches, slightly finer material than A₂.
- B₂. 13 to 24 inches, brown soft gritty clay loam containing some partly weathered particles of biotite and other minerals; root penetration free, but roots fewer than in the horizon above.
- B₃. 24 to 30 inches, yellowish-brown soft crumbly clay loam; slightly lighter, less oxidized, and higher in content of partly weathered biotite particles and other mineral particles than horizon B₂.
- C. 30 to 48 inches, yellowish-brown soft light gritty clay loam; many weathered fragments of granite-gneiss, especially in the lower part.
- D. 48 inches +, parent rock of granite-gneiss.

Generally the C horizon has formed to a depth of 8 feet or more. The depth depends primarily on the mineral composition of the rock and on the ability of the component minerals to resist weathering.

Porters Series

Porters soils are on hilly, steep, and very steep relief in mountainous areas. They are weakly developed, or lithosolic, Gray-Brown Podzolic soils formed from weathered products of granite-gneiss (pl. 4, B). Their depth to bedrock is generally less than 40 inches, and outcrops of bedrock appear in some places. Loose rock fragments up to 10 inches in diameter are common on the surface and in the soils over a large part of the area.

Porters soils are characterized by a dark-brown, brown, or yellowish-brown mellow surface layer and a brown to yellowish-brown very permeable subsoil. Although the color profile is fairly distinct, the texture profile has no sharp differentiation. The soils have developed under a forest of deciduous trees and in a cool moist climate comparable with that at higher latitudes in the Gray-Brown Podzolic soil region. Restricted profile development, steep relief, and high elevation distinguish the Porters soils from the Balfour, which are at lower elevations on milder relief and have moderately well-developed profiles.

Tusquitee Series

The soils of the Tusquitee series are on level to strongly sloping colluvial slopes and have formed from rock waste and soil material washed or rolled onto the foot slopes.

Considerable range exists in the age of these soils, and they are subject to change through the addition of new material by colluvial action. Although the well-developed Tusquitee soils belong to the Gray-Brown Podzolic great soil group, young soils are included in mapping that should be considered members of the Alluvial soils great soil group because they lack clearly defined profile development and show very little differentiation in color and other characteristics.

In forested areas where erosion has affected the soil very little, Tusquitee loam, eroded rolling phase, has the following profile characteristics:

- A. 0 to 18 inches, dark grayish-brown loose gritty loam high in content of organic matter derived largely from decayed leaves and twigs.
- B. 18 to 43 inches, yellowish-brown soft crumbly clay loam, easily pressed into short plastic ribbons when moist.
- C. 43 to 78 inches, brownish-yellow crumbly clay loam, underlain by weathered granite-gneiss that apparently has made no contribution to the composition of the overlying profile.

Tate Series

The Tate soils have formed on level to very strongly sloping positions near the foot of upland slopes from local colluvial and alluvial materials washed or sloughed from soils on the upland. They are characterized by the presence of finely divided mica flakes. Their profile varies somewhat in color and content of mica flakes, depending on the character of the soil from which the parent material was derived. External drainage is slow to rapid and internal drainage is medium.

State Series

The soil of the State series is located on level to gently sloping stream terraces somewhat lower than those on which Hiwassee soils are developed. It has formed from alluvium composed of materials derived from soils on uplands underlain by igneous and metamorphic rocks. Its moderately well-developed profile resembles that of the Gray-Brown Podzolic soils. In time the State soil probably will develop the characteristics of the Hiwassee soils, which are classified as members of the Red Podzolic great soil group.

Cultivated areas of State silt loam, undulating phase, have these characteristics:

- A₂. 0 to 10 inches, very dark grayish-brown loose fluffy smooth silt loam containing a large quantity of organic matter.
- A₃. 10 to 14 inches, grayish-brown crumbly heavy silt loam; much lower organic-matter content than in horizon A₂.
- B₂. 14 to 36 inches, brown clay loam; soft and crumbly when in a normally moist condition but somewhat plastic and easily pressed into soft smooth ribbons if the moisture content is increased; lower part slightly heavier clay loam than the upper.
- C. 36 to 72 inches, light-brown micaceous sandy clay or light gritty clay loam underlain by a stratum of coarse quartz sand or quartz gravel.

INTRAZONAL SOILS

Intrazonal soils are any of the great groups of soils with more or less well-developed soil characteristics that reflect the dominating influence of some local factor of relief, parent material, or age over the normal effect of the climate and vegetation (13). In Towns County the intrazonal soils are members of the Planosols great soil group.

PLANOSOLS

The Planosols are an intrazonal group of soils with an eluviated surface horizon underlain by a B horizon more strongly illuviated, cemented, or compacted than in associated soils. They developed on nearly level upland under grass or forest vegetation in a humid or subhumid climate (13). Members of the Warne and Spilo series are Planosols.

Warne Series

The soils of the Warne series are on low terraces of very gently sloping to strongly sloping relief and are associated with the Altavista soils of the stream terraces and with the Congaree and other soils of the bottom lands. In Towns County Warne soils are associated with those of the Worsham series and are mapped only in complex with Worsham soils. Warne soils have formed from alluvium consisting of materials derived from uplands underlain by igneous and metamorphic rocks.

The outstanding features of the Warne soil are its light-gray friable surface soil about 10 inches thick and its light-gray very stiff compact more or less cemented clay subsoil. The unusually dense subsoil is associated with slow external and internal drainage, but whether the slow internal drainage is the cause or the effect of the denseness is not known. Possibly the relatively dense horizons in the original alluvium restricted internal drainage, and together with slow external drainage and fine-textured soil materials, brought about abnormal concentration and compactness and some siliceous cementation in the subsoil.

The subsoil generally is about 26 inches thick but in some places it is 60 inches or more. Immediately below the subsoil is a layer of white angular quartz fragments weakly cemented together with silica and streaked with iron coloring.

Spilo Series

The Spilo soils, irregularly developed Planosols, are associated with soils of the Chewacla series, which are members of the Alluvial soils great soil group. The Spilo have developed from older alluvium than have the Chewacla soils and occupy slightly higher positions in first bottoms, or those bordering on the uplands. They are level and nearly level and have slow to very slow internal drainage.

In representative areas the surface layer consists of light-gray to medium-gray compact silty clay loam. The subsoil is light-gray dense heavy clay or sandy clay, which because of fine texture and lack of structure, is almost impervious to water. The maximum subsoil development has taken place between depths of 20 and 30 inches, below which the soil material grades from light-gray micaceous sandy

clay stained with yellow into similarly colored micaceous loamy fine sand.

AZONAL SOILS

Azonal soils are without well-defined profile characteristics because of their youth or because of conditions of parent material or relief that prevent development of normal soil-profile characteristics (13). In Towns County, alluvial soils and lithosols belong to this soil order.

ALLUVIAL SOILS

Alluvial soils are an azonal group of soils developed from transported and relatively recently deposited material (alluvium) and are characterized by a weak modification (or none) of the original material by soil-forming processes (13). In Towns County this group is made up of the Congaree, Transylvania, Chewacla, and Toxaway series.

The Congaree and Transylvania soils are well drained; Chewacla soils are imperfectly drained in most places; and Toxaway soils are poorly drained and have some of the characteristics of Half Bog soils. The Congaree soils are similar to the Chewacla soils, but are derived from alluvium consisting of material that originated from uplands underlain by granite-gneiss and micaceous schist.

The Transylvania and Toxaway soils are near the headwaters of mountain streams and have derived from material washed mainly from wooded areas of Porters soils. The Transylvania soils are higher in organic-matter content and more crumbly and plastic throughout than the Congaree soils. The Toxaway soils have a nearly black surface soil, the dark color apparently being the result of accumulated organic matter. The underlying horizon consists of mottled gray and brown pervious silty clay loam of plastic consistence.

Congaree Series

Congaree soils are in first bottoms near streams and have formed from alluvium washed from uplands underlain by igneous and metamorphic rocks. The adjacent streams overflow during heavy rains and deposit new materials on the soils. This addition of new materials from time to time keeps the soils young, and very little development of genetically related profile horizons is evident. The profile varies from place to place in kind, thickness, and arrangement of the poorly defined horizons that have formed. From the surface downward, the soils range from grayish brown and brown to light brown or yellowish brown and become mottled in the lower part of the profile.

Cultivated areas of Congaree fine sandy loam have the following characteristics:

1. 0 to 10 inches, grayish-brown friable loose fine sandy loam in which the organic-matter content is low but sufficient to give a slightly gray color.
2. 10 to 36 inches, brown or yellowish-brown friable loose fine sandy loam.
3. 36 inches +, mottled brown and gray friable loose fine sandy loam underlain at a variable depth by somewhat compact but crumbly silt loam or by stratified well-rounded channel gravel.

Transylvania Series

Soils of the Transylvania series are in first bottoms near streams and occur in association with the Toxaway and other soils of bottom lands. They have formed from alluvial materials derived from uplands underlain by granite-gneiss and micaceous schist. They differ from Congaree soils in having a darker colored surface layer and a larger organic-matter content. The soils are young, and the texture profile shows very little differentiation. They are mottled in the lower part of the soil profile in many places. Their profile development is restricted by the low relief and by new material deposited when adjacent streams overflow. They lie only a few feet above the normal level of the water in the streams.

Chewacla Series

The Chewacla soil has formed in first bottoms near streams from alluvial material washed from uplands underlain mainly by micaceous schist. It is highly micaceous and friable throughout but lacks the crumbly consistence of Congaree soils. The uppermost 10- to 12-inch layer is brown, below which is mottled gray and brown material. Most Chewacla soil is imperfectly drained, but in a few places it is fairly well drained. Some areas are waterlogged in the lower part throughout most of the year.

Toxaway Series

The Toxaway soil is associated with the Transylvania soils on bottom lands. It is developed in first bottoms near the headwaters of mountain streams and has formed from alluvium consisting mainly of material washed from forested areas of Porters soils. It has a higher organic-matter content in the surface layer and a more plastic consistence throughout the profile than the Congaree and Transylvania soils.

The dark color of the surface soil is due to the large quantity of accumulated organic matter. Beneath the surface layer the soil is gray or gray streaked or mottled with brown, pervious but plastic silty clay loam or silt loam. In the lower part of the profile the Toxaway soil resembles Half Bog soils, but the surface layer contains somewhat less organic matter than surface layers of Half Bog soils. In this county the Toxaway soil has a glei layer.

LITHOSOLS

Lithosols are an azonal group of soils, largely confined to steeply sloping land, that have no clearly expressed soil morphology. They consist of a freshly and imperfectly weathered mass of rock fragments (13).

In this county, Lithosols include miscellaneous land types that could not be correlated as definite soil types. The most extensive type is rough, stony, and very steep; others are colluvium containing many rock fragments, a mixture of alluvial soils, and rough gullied land. On the steep slopes of the rough stony land geologic erosion almost keeps pace with rock weathering and soil formation, or rock and soil

material slough, slide, or roll down the steep slopes. These conditions are unfavorable to the formation of true soils, but small areas of zonal soils have formed and are included with the Lithosols.

Rough Gullied Land (Hayesville Soil Material)

Rough gullied land (Hayesville soil material) occupies areas, formerly of Hayesville soils, that have been severely truncated by accelerated erosion. Practically all of the surface, or eluviated, layer has been lost, and a large part of the subsoil as well. Gullies prevail in an intricate pattern and in places extend down to the partly disintegrated material of the substratum.

Rough Stony Land (Porters Soil Material)

Rough stony land (Porters soil material), is made up of rough, very steep (60 percent or more slopes), and stony mountain areas in which the soil consists of Porters soil material. Loose fragments and bedrock outcrops of granite-gneiss are numerous. Very little profile development has taken place, and the soil that has formed is mostly shallow to bedrock. In some places only the surface layer has formed, and it grades into decomposed rock or lies on bedrock.

Stony Colluvium (Porters and Hayesville Soil Materials)

Stony colluvium (Porters and Hayesville soil materials) is on foot slopes, mainly in the intermountain uplands. It consists principally of colluvial material derived from soils of the Porters and Hayesville series, but in some places, of alluvial material. Angular rock fragments are strewn over the surface and mixed with the soil mass. Because this stony material is unfavorable to the formation of a soil, very little profile development has taken place.

Alluvial Soils, Undifferentiated

Alluvial soils, undifferentiated, occur on first bottoms near streams in association with Congaree and other bottom-land soils. This separation consists of a mixture of soils different in color, texture, consistence, and drainage conditions. The individual areas are too small to map separately. The soils are subject to change because new material is added each time the streams overflow.

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


TABLE 7.—Major characteristics of the soil series of Towns County, Ga.

SOILS OF UPLANDS

Soil series	Topographic position	Dominant relief	Internal drainage	Parent material	Surface layer			Subsoil ¹				Productivity	Remarks
					Color	Consistence	Approximate thickness ²	Color	Consistence	Texture	Approximate thickness		
Porters	Mountaintops and slopes	Steep and very steep	Medium	Residual material derived from weathering of granite-gneiss and schist.	Brown or grayish brown.	Friable	Inches ³ 7	Brown, reddish brown, or yellowish brown.	Loose, crumbly	Clay loam	Inches 20	Good to poor	Most of the land is in forest; some is lying idle; and a small part is used for crops and pasture. A very large part is stony. Erosion is usually slight to moderate but in places is severe.
Balfour	Mountain ridges and lower slopes	Gently rolling and rolling	do	do	Brown	do	8	Brown or yellowish brown.	Crumbly	do	24	Good	A large part is in forest; some is used for crops and pasture; and some is idle. A fairly large part is stony. Erosion is usually slight to moderate but in places is severe.
Rabun	Mountain ridges and steep slopes	Hilly and steep	do	Hornblende gneiss in places mixed with biotite schist and granite-gneiss.	Brownish red	Very crumbly	8	Brownish red in upper part; red in lower part.	Crumbly, relatively heavy	do	26	Fair to good	Some areas are in forest; some are used as cropland; and others are idle. The soil generally is stony. Erosion is ordinarily slight to moderate but in some areas is severe.
Talladega	Rough mountainous country, as knobs, narrow ridges, and steep slopes	Steep	do	Micaceous schist	Reddish brown	Loose, friable, mellow	8	Red, yellowish red, or reddish yellow.	Friable (highly micaceous)	do	18	Poor to very poor	Nearly all soil is in forest. Some land is idle; a small area is used for crops and pasture. Erosion is slight to severe.
Fannin	Intermountain uplands	Hilly	do	do	Grayish brown or reddish brown	Friable, mellow	48	Red	Dense, heavy, moderately plastic	do	25	Good to very poor	A large part of the soil is in forest; some favorable areas are cropped, mainly to corn. Erosion is slight to severe. A large part of the eroded soil is lying idle.
Hayesville	do	do	do	Granite-gneiss	Dark grayish brown, dark brown, light brown, or reddish brown.	Loose, friable	47	do	Heavy, friable	do	25	do	A large part of the soil is in forest; a fairly large part is idle; and a small part is used for crops and pasture. A fairly large area is stony. Erosion is slight to severe.
Worsham	Lower slopes along stream terraces of the intermountain uplands. ⁴	Gently undulating to rolling	Slow to very slow	do	Light gray or medium gray	Friable	7	Brownish yellow	Friable	Silty clay loam	15	Fair	A large part of the soil is used for crops; the rest is in permanent pasture or forest or is lying idle. Erosion is slight to moderate.

SOILS OF COLLUVIAL LANDS

Tusquitzee	Colluvial slopes	Gently sloping to strongly sloping	Medium	Accumulations of rock waste and soil materials sloughed or washed from Porters and associated soils.	Dark grayish brown, dark brown, or dark gray	Loose	18	Yellowish brown or brown	Soft, crumbly	Clay loam	25	Good	A large part of the soil is used for crops and a small part for permanent pasture and forest. A fairly large area is stony. Erosion is slight to moderate.
Tate	do	Level to very gently sloping	do	Accumulations of colluvial and local alluvial materials washed from Fannin, Talladega, and Hayesville soils.	Red, reddish brown, or yellowish red	Crumbly	12	Red or yellow	Crumbly, moderately compact, or heavy	do	25	do	A large total area is used for crops, a fairly large acreage for permanent pasture. The rest is mainly idle. Erosion is slight to moderate.

SOILS OF TERRACES

Hiwassee	High terraces not subject to overflow	Moderately sloping and strongly sloping	Medium	Old alluvium derived from Porters, Hayesville, and associated soils.	Dark reddish brown	Soft, crumbly	9	Dark red	Crumbly	Clay loam	31	Good	Used mostly for crops. Erosion ranges from slight to severe.
Altavista	Moderately high to low terraces; some low-lying areas subject to overflow	Very gently sloping to strongly sloping	Slow	Alluvium derived from uplands underlain by granite-gneiss and schist rocks.	Light gray, medium gray, or slightly grayish yellow	Loose, friable	8	Grayish yellow, moderate yellow, or pale yellow	Moderately compact, stiff, heavy	do	18	Fair to good	A large part is used for crops; some areas are used for pasture; others are lying idle; and still others are in forest. Erosion is slight to moderate.
Warne	Low terraces	do	Slow to very slow	do	Light gray	Loose	10	Light gray, streaked dull yellow	Tough, almost impervious	Clay	26	Fair to poor	A large part is used for crops; the rest is in permanent pasture and forest or is lying idle. Erosion is slight to moderate.
State	Low terraces and second bottoms	Gently sloping	Medium	Alluvium derived from Porters, Talladega, Hayesville, and associated soils.	Very dark grayish brown	Loose, fluffy	7 10	Brown	Soft, crumbly	Clay loam	24	Very good	Used almost entirely for crops. Erosion is slight.

SOILS OF BOTTOM LANDS

Congaree	First bottoms subject to overflow	Level and nearly level	Medium	Alluvium derived from uplands underlain by granite, granite-gneiss, and micaceous schist, and to a less extent by basic and subbasic metamorphic rocks.	Grayish brown or brown	Friable, fluffy, or moderately compact	9	Brown or yellowish brown	Friable, crumbly, or loose	Silt loam or fine sandy clay	8 24	Good to very good	Used almost entirely for crops, mainly corn. Erosion has affected the soil very little.
Transylvania	do	do	do	Alluvium derived from Porters and other soils on uplands of high elevation.	Dark grayish brown or dark brown	Loose, very crumbly	15	Dark brown	Very crumbly	do	24	Very good	Used almost entirely for crops, mainly corn. Other crops are rye, lespedeza, sorghum cane, snap beans, and potatoes. Erosion has affected the soil very little.
Chewacla	do	do	Slow to very slow	Alluvium derived from Fannin and Talladega soils and associated soils derived from micaceous schist.	Grayish brown or brown	Loose, fluffy (highly micaceous)	8	Brown	Loose (very micaceous)	Silt loam	8 10	Good	Mostly cleared land used largely for crops, including vegetables. Erosion apparently has not affected the soil.
Spilo	do	do	do	Alluvium derived from soils of uplands underlain by micaceous schist and granite-gneiss.	Light gray or medium gray	Compact	8	Light gray, streaked or mottled dull yellowish brown	Tough, slowly pervious	Clay	10 17	Poor to fair	A relatively large area has been drained and is used for crops; undrained land is used to some extent for pasture. Over a fairly large area use of the land is restricted by poor drainage.
Toxaway	do	do	Slow	Alluvium derived from uncleared areas of Porters soils and associated soils lying at high elevations on the uplands.	Very dark gray or black	Crumbly, highly plastic	15	Dark gray, medium gray, or bluish gray, streaked dull brown	Crumbly, highly plastic	Silty clay loam or light-textured clay loam	25	Good	About half of the total area is used for corn; the rest, mostly for small grain, vegetables, and permanent pasture; nearly all of the soil has been artificially drained.

¹ The subsoil, or that part of the soil immediately below the surface layer, generally is uniform in color and slightly finer in texture than the surface layer. In some soils a transitional layer lies between the surface layer and the subsoil.

² The thickness in places where erosion has not appreciably reduced the surface layer.

³ In many places only a very thin subsoil is present and the surface layer passes almost directly into weathered micaceous schist.

⁴ A transitional layer of reddish-brown crumbly light-textured clay loam, 4 or 5 inches thick, lies between the surface layer and the subsoil.

⁵ A transitional layer of brownish-red light-textured clay loam, 2 to 5 inches thick, lies between the surface layer and the subsoil.

⁶ Worsham soil is in part derived from colluvial materials. In this county it is closely associated with Warne soils of the stream terraces and is mapped with them in a complex.

⁷ A thin transitional layer of dark-brown crumbly heavy-textured silt loam lies between the surface layer and the subsoil.

⁸ The subsoil is underlain by gray or gray mottled with brown friable fine sandy loam or crumbly silt loam.

⁹ Directly below this layer is dull brown, mottled with various shades of gray, loose highly micaceous silt loam.

¹⁰ Underlying this layer is bluish-gray tough plastic clay.

SOILS OF TOWNS COUNTY, GA.: SUMMARY OF IMPORTANT CHARACTERISTICS

Soil	Map symbol	Group (according to legend on map)	Relief	Internal drainage ¹	Parent material	Color		Consistence (subsoil)
						Surface soil ²	Subsoil	
Alluvial soils, undifferentiated	A	Poorly drained soils of the bottom land.	Level to nearly level	Medium to slow.	Alluvium from uplands underlain mainly by granite, granite-gneiss, and micaceous schist rock.	Brown in well-drained areas; black in poorly drained areas.	Differs little from surface soil.	Friable to fairly heavy.
Altavista clay loam: Eroded rolling phase	ACG	Sloping yellow soils of the stream terraces.	Moderately to strongly sloping.	Slow	Alluvium from uplands underlain by granite-gneiss and schist rock.	Medium gray or slightly grayish yellow.	Grayish yellow or moderate yellow.	Stiff; moderately plastic when moist; compact and hard when dry.
Eroded undulating phase	ACT	Sloping yellow soils of the stream terraces.	Very gently to gently sloping.	Slow	Alluvium from uplands underlain by granite-gneiss and schist rock.	Medium gray or slightly grayish yellow.	Grayish yellow or moderate yellow.	Stiff; moderately plastic when moist; compact and hard when dry.
Altavista loam: Undulating phase	ALU	Sloping yellow soils of the stream terraces.	Very gently to gently sloping.	Slow	Alluvium from uplands underlain by granite-gneiss and schist rock.	Medium gray or slightly grayish yellow.	Grayish yellow or moderate yellow.	Stiff; moderately plastic when moist; compact and hard when dry.
Undulating low terrace phase	ALK	Sloping yellow soils of the stream terraces.	Very gently undulating	Slow	Alluvium from uplands underlain by granite-gneiss and schist rock.	Light gray when dry; medium gray when wet.	Light grayish yellow, moderate yellow, or pale yellow.	Slightly compact and plastic to dense and heavy.
Balfour loam, rolling phase	BLN	Rolling red and brown soils of the uplands.	Gently rolling to rolling	Medium	Residual material from weathered granite-gneiss rock.	Brown	Brown or yellowish brown	Crumby.
Balfour stony loam, eroded rolling phase	BSG	Rolling red and brown soils of the uplands.	Gently rolling to rolling	Medium	Residual material from weathered granite-gneiss rock.	Brown or slightly yellowish brown.	Brown or yellowish brown	Crumby.
Chewacla silt loam	CH	Well-drained and fairly well-drained soils of the bottom land.	Level to nearly level	Slow to very slow.	Alluvium from uplands underlain by micaceous schist rock.	Brown or grayish brown	Brown, becoming mottled with gray at a depth of about 18 inches.	Loose (highly micaceous).
Congaree fine sandy loam	CF	Well-drained and fairly well-drained soils of the bottom land.	Level to nearly level	Medium	Alluvium from uplands underlain chiefly by granite, granite-gneiss, and micaceous schist rock.	Grayish brown or brown	Brown or yellowish brown	Friable, loose.
Congaree silt loam	CO	Well-drained and fairly well-drained soils of the bottom lands.	Level to nearly level	Medium	Alluvium from uplands underlain chiefly by granite, granite-gneiss, and micaceous schist rock.	Grayish brown or brown	Brown	Crumby.
Fannin clay loam: Eroded hilly phase	Fco	Hilly red and brown soils of uplands.	Hilly	Medium	Residual material from weathered micaceous schist rock.	Slightly reddish brown to reddish brown.	Reddish brown, becoming red with increasing depth.	Crumby, becoming dense and moderately plastic with increasing depth.
Eroded rolling phase	Fcg	Rolling red and brown soils of uplands.	Gently rolling to rolling	Medium	Residual material from weathered micaceous schist rock.	Slightly reddish brown, reddish brown, or brownish red.	Reddish brown, becoming red with increasing depth.	Crumby, becoming dense and moderately plastic with increasing depth.
Severely eroded hilly phase	Fce	Hilly red and brown soils of uplands.	Hilly	Medium	Residual material from weathered micaceous schist rock.	Reddish brown or red	Reddish brown, becoming red with increasing depth.	Crumby, becoming dense and moderately plastic with increasing depth.
Fannin loam, rolling phase	FLN	Rolling red and brown soils of uplands.	Gently undulating to rolling	Medium	Residual material from weathered micaceous schist rock.	Grayish brown or brown	Reddish brown, becoming red with increasing depth.	Crumby, becoming dense and moderately plastic with increasing depth.
Fannin-Talladega loams, hilly phases	FTH	Hilly red and brown soils of uplands.	Hilly	Medium	Residual material from weathered micaceous schist rock.	Grayish brown, brown, or reddish brown.	Reddish brown, red, or yellowish red.	Crumby, becoming dense and moderately plastic with increasing depth (Fannin); friable, crumbly, highly micaceous (Talladega).
Hayesville clay loam: Eroded hilly phase	Hco	Hilly red and brown soils of the uplands.	Hilly	Medium	Residual material from weathered granite-gneiss rock.	Reddish brown, brownish red, or red	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Eroded rolling phase	HCG	Rolling red and brown soils of the uplands.	Gently rolling to rolling	Medium	Residual material from weathered granite-gneiss rock.	Reddish brown or red	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Eroded steep phase	Hcr	Steep red and brown soils of the uplands.	Steep	Medium	Residual material from weathered granite-gneiss rock.	Reddish brown, brownish red, or red	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Severely eroded hilly phase	Hcs	Hilly red and brown soils of the uplands.	Hilly	Medium	Residual material from weathered granite-gneiss rock.	Brownish red or red	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Severely eroded rolling phase	Hcs	Rolling red and brown soils of the uplands.	Gently rolling to rolling	Medium	Residual material from weathered granite-gneiss rock.	Brownish red or red	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Severely eroded steep phase	Hcp	Steep red and brown soils of the uplands.	Steep	Medium	Residual material from weathered granite-gneiss rock.	Brownish red or red	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Hayesville loam: Eroded undulating phase	HLT	Rolling red and brown soils of the uplands.	Gently undulating to undulating	Medium	Residual material from weathered granite-gneiss rock.	Dark grayish brown, dark brown, grayish brown, light brown, or slightly reddish brown	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Hilly phase	HLH	Hilly red and brown soils of the uplands.	Hilly	Medium	Residual material from weathered granite-gneiss rock.	Dark grayish brown, dark brown, grayish brown, or light brown	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Rolling phase	HLN	Rolling red and brown soils of the uplands.	Gently rolling to rolling	Medium	Residual material from weathered granite-gneiss rock.	Dark grayish brown, dark brown, grayish brown, or light brown	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth
Steep phase	HLZ	Steep red and brown soils of the uplands.	Steep	Medium	Residual material from weathered granite-gneiss rock.	Dark grayish brown, dark brown, grayish brown, or light brown	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Hayesville stony clay loam: Eroded hilly phase	Hto	Hilly red and brown soils of the uplands.	Hilly	Medium	Residual material from weathered granite-gneiss rock.	Reddish brown, brownish red, or red	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Eroded rolling phase	Htg	Rolling red and brown soils of the uplands.	Gently rolling to rolling	Medium	Residual material from weathered granite-gneiss rock.	Reddish brown, brownish red, or red	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Severely eroded hilly phase	Hte	Hilly red and brown soils of the uplands.	Hilly	Medium	Residual material from weathered granite-gneiss rock.	Brownish red or red	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Hayesville stony loam: Hilly phase	Hsh	Hilly red and brown soils of the uplands.	Hilly	Medium	Residual material from weathered granite-gneiss rock.	Dark grayish brown, dark brown, grayish brown, or light brown	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Rolling phase	Hsn	Rolling red and brown soils of the uplands.	Gently rolling to rolling	Medium	Residual material from weathered granite-gneiss rock	Dark grayish brown, dark brown, grayish brown, or light brown	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Steep phase	Hsz	Steep red and brown soils of the uplands.	Steep	Medium	Residual material from weathered granite-gneiss rock	Dark grayish brown, dark brown, grayish brown, or light brown	Brownish red, becoming red with increasing depth.	Crumby, becoming heavy with increasing depth.
Hiwassee-Hayesville stony loams, eroded hilly phases	HHo	Sloping red and brown soils of the stream terraces.	Very strongly sloping to hilly	Medium	Old alluvium composed of material derived from Porters, Hayesville, and associated soils (Hiwassee); residual material from weathered granite-gneiss rock (Hayesville).	Reddish brown or red (Hiwassee); reddish brown, brownish red, or red (Hayesville)	Dark red (Hiwassee); brownish red, becoming red with increasing depth (Hayesville)	Crumby (Hiwassee); crumbly, becoming heavy with increasing depth (Hayesville).
Hiwassee loam: Eroded rolling phase	Hwg	Sloping red and brown soils of the stream terraces.	Moderately to strongly sloping	Medium	Old alluvium composed of material derived from Porters, Hayesville, and associated soils.	Reddish brown or brownish red	Dark red	Crumby.
Eroded undulating phase	Hwr	Sloping red and brown soils of stream terraces.	Very gently to gently sloping	Medium	Old alluvium composed of material derived from Porters, Hayesville, and associated soils.	Reddish brown or red	Dark red	Crumby.
Undulating phase	Hwu	Sloping red and brown soils of the stream terraces.	Very gently to gently sloping	Medium	Old alluvium composed of material derived from Porters, Hayesville, and associated soils.	Dark reddish brown	Dark red	Crumby.
Porters-Balfour clay loams, eroded hilly phases	Pso	Hilly red and brown soils of the uplands.	Hilly	Medium	Residual material from weathered granite-gneiss rock.	Dark brown, brown, or yellowish brown	Brown or yellowish brown	Crumby.
Porters-Balfour loams, hilly phases	Pbh	Hilly red and brown soils of the uplands.	Hilly	Medium	Residual material from weathered granite-gneiss rock.	Dark brown or brown	Brown or yellowish brown	Crumby.
Porters-Balfour stony clay loams, eroded hilly phases	Pco	Hilly red and brown soils of the uplands.	Hilly	Medium	Residual material from weathered granite-gneiss rock.	Dark brown, brown, or yellowish brown	Brown or yellowish brown	Crumby.
Porters-Balfour stony loams, hilly phases	Prh	Hilly red and brown soils of the uplands.	Hilly	Medium	Residual material from weathered granite-gneiss rock.	Dark brown or brown	Brown or yellowish brown	Crumby.
Porters loam: Eroded steep phase	PLF	Steep red and brown soils of the uplands.	Steep	Medium	Residual material from weathered granite-gneiss rock.	Dark brown, brown, or yellowish brown	Brown or yellowish brown	Crumby.
Steep phase	PLZ	Steep red and brown soils of the uplands.	Steep	Medium	Residual material from weathered granite-gneiss rock.	Dark brown or brown	Brown or yellowish brown	Crumby.

SOILS OF TOWNS COUNTY, GA.: SUMMARY OF IMPORTANT CHARACTERISTICS—Continued

Soil	Map symbol	Group (according to legend on map)	Relief	Internal drainage ¹	Parent material	Color		Consistence (subsoil)
						Surface soil ²	Subsoil	
Porters stony loam: Eroded steep phase-----	PsF	Steep red and brown soils of the uplands.	Steep-----	Medium-----	Residual material from weathered granite-gneiss rock.	Dark brown, brown, or yellowish brown.	Brown or yellowish brown.	Crumbly.
Steep phase-----	Psz	Steep red and brown soils of the uplands.	Steep-----	Medium-----	Residual material from weathered granite-gneiss rock.	Brown or yellowish brown.	Brown or yellowish brown.	Crumbly.
Very steep phase-----	Psv	Steep, stony, or severely gullied shallow soils of the uplands.	Very steep-----	Medium-----	Residual material from weathered granite-gneiss rock.	Brown or yellowish brown.	Brown or yellowish brown.	Crumbly.
Rabun stony clay loam: Eroded rolling phase-----	Rcg	Rolling red and brown soils of the uplands.	Gently rolling to rolling.	Medium-----	Residual material from weathered hornblende gneiss rock.	Brownish red-----	Brownish red, becoming red at a depth of about 15 inches.	Crumbly.
Eroded steep phase-----	Rcf	Steep red and brown soils of the uplands.	Steep-----	Medium-----	Residual material from weathered hornblende gneiss rock.	Brownish red-----	Brownish red, becoming red at a depth of about 15 inches.	Crumbly.
Steep phase-----	Rcz	Steep red and brown soils of the uplands.	Steep-----	Medium-----	Residual material from weathered hornblende gneiss rock.	Brownish red-----	Brownish red, becoming red at a depth of about 15 inches.	Crumbly.
Rough gullied land (Hayesville soil material).	RgH	Steep, stony, or severely gullied shallow soils of the uplands.	Gently rolling to steep-----	Medium-----	Residual material from weathered granite-gneiss rock.	Dark grayish brown to light brown in uneroded and slightly eroded soil.	Brownish red or red; light-red parent material is exposed over about 50 percent of the eroded area.	Crumbly.
Rough stony land (Porters soil material).	RsP	Steep, stony, or severely gullied shallow soils of the uplands.	Very steep-----	Medium-----	Residual material mainly from weathered granite-gneiss rock, but in some places from weathered material of quartz schist, mica schist, quartzite, or hornblende gneiss.	Grayish-brown or brown Porters soil material to a depth of less than 20 inches in most places where underlain by the parent rock.	-----	-----
Spilo-Chewacla silt loams-----	SC	Poorly drained soils of the bottom land.	Level to nearly level-----	Very slow to slow.	Alluvium from uplands underlain by micaceous schist and granite-gneiss rock.	Light gray or medium gray (Spilo); brown or grayish brown (Chewacla).	Light gray streaked or mottled with dull yellowish brown (Spilo); brown, becoming mottled with gray at a depth of about 18 inches (Chewacla).	Tough (Spilo); loose, highly micaceous (Chewacla).
Spilo silty clay loam-----	Ss	Poorly drained soils of the bottom land.	Level to nearly level-----	Very slow-----	Alluvium from uplands underlain by micaceous schist and granite-gneiss rock.	Light gray or medium gray.	Light gray, streaked or mottled with dull yellowish brown.	Tough.
Better drained phase-----	SSB	Well-drained and fairly well-drained soils of the bottom land.	Level to nearly level-----	Slow-----	Alluvium from uplands underlain by micaceous schist and granite-gneiss rock.	Light gray or medium gray.	Light gray, streaked or mottled with dull yellowish brown.	Tough.
State silt loam, undulating phase.	STU	Sloping red and brown soils of the stream terraces.	Level to gently sloping-----	Medium-----	Alluvium composed of materials from Porters, Talladega, Hayesville, and associated soils.	Dark grayish brown-----	Brown-----	Soft, crumbly.
Stony colluvium (Porters and Hayesville soil materials).	ScP	Extremely stony soils of the colluvial lands.	Level to strongly sloping.	Medium to rapid.	Colluvial and alluvial material mainly from Porters and Hayesville soils.	Dark gray or grayish brown; consists of a mass of rock fragments with which is mixed a small quantity of soil having no differentiation between the surface soil and subsoil.	-----	-----
Talladega clay loam, severely eroded steep phase.	Tcp	Steep, stony, or severely gullied shallow soils of the uplands.	Steep-----	Medium-----	Residual material from weathered micaceous schist rock.	Brownish red, red, or yellowish red.	Red or yellowish red-----	Friable, crumbly (highly micaceous).
Talladega loam, steep phase-----	TGZ	Steep, stony, or severely gullied shallow soils of the uplands.	Steep-----	Medium-----	Residual material from weathered micaceous schist rock.	Reddish brown-----	Red or yellowish red-----	Friable, crumbly (highly micaceous).
Tate-Chewacla silt loams-----	TC	Soils of the colluvial lands (stone-free to moderately stony).	Level to nearly level-----	Medium to very slow.	Colluvial and alluvial materials from Fannin, Talladega, Hayesville, and associated soils.	Red, yellowish brown, or reddish brown.	Grayish brown, mottled gray and brown, or light gray.	Loose (micaceous), crumbly or moderately compact; light-gray material dense and compact.
Tate silt loam: Eroded rolling phase-----	TAG	Soils of the colluvial lands (stone-free to moderately stony).	Moderately to strongly sloping.	Medium-----	Colluvial and local alluvial materials from Fannin, Talladega, and Hayesville soils.	Red, reddish brown, or brownish yellow.	Red, brownish yellow, or moderate yellow.	Crumbly or moderately compact.
Undulating phase-----	TAU	Soils of the colluvial lands (stone-free to moderately stony).	Very gently to gently sloping.	Medium-----	Colluvial and local alluvial materials from Fannin, Talladega, and Hayesville soils.	Red, reddish brown, or brown.	Red, brownish yellow, or moderate yellow.	Crumbly or moderately compact.
Toxaway silt loam-----	Tx	Well-drained and fairly well-drained soils of the bottom lands.	Level to nearly level-----	Slow-----	Alluvium from forested areas of Porters and associated soils lying at high elevations.	Very dark gray or almost black.	Medium gray or dark gray, mottled or streaked with dull brown.	Highly plastic.
Transylvania fine sandy loam-----	TF	Well-drained and fairly well-drained soils of the bottom lands.	Level to nearly level-----	Medium-----	Alluvium from Porters and other soils lying at high elevations.	Dark grayish brown or dark brown.	Dark brown-----	Very crumbly.
Transylvania silt loam-----	TR	Well-drained and fairly well-drained soils of the bottom lands.	Level to nearly level-----	Medium-----	Alluvium from Porters and other soils lying at high elevations.	Dark grayish brown or dark brown.	Dark brown-----	Very crumbly, slightly plastic.
Tusquitee loam: Eroded rolling phase-----	TLG	Soils of the colluvial lands (stone-free to moderately stony).	Moderately to strongly sloping.	Medium-----	Colluvial material from Porters and associated soils.	Dark grayish brown or dark brown.	Yellowish brown or brown-----	Crumbly.
Undulating phase-----	TLU	Soils of the colluvial lands (stone-free to moderately stony).	Very gently to gently undulating.	Medium-----	Colluvial material from Porters and associated soils.	Dark grayish brown or dark brown.	Yellowish brown or brown-----	Crumbly.
Tusquitee stony loam, undulating phase.	TSU	Soils of the colluvial lands (stone-free to moderately stony).	Level to gently undulating.	Medium-----	Colluvial material from Porters and associated soils.	Dark grayish brown or dark brown.	Yellowish brown or brown-----	Crumbly.
Warne-Worsham loams: Eroded rolling phases-----	WWG	Sloping yellow soils of the stream terraces.	Moderately to strongly sloping.	Slow to very slow.	Alluvium from uplands underlain by granite-gneiss and schist rock (Warne); residual material from weathered granite-gneiss rock (Worsham).	Light gray (Warne); light gray or medium gray (Worsham).	Light gray, streaked with dull yellow (Warne); brownish yellow or moderate yellow (Worsham).	Tough (Warne); friable (Worsham).
Undulating phases-----	WWU	Sloping yellow soils of the stream terraces.	Very gently to gently undulating.	Slow to very slow.	Alluvium from uplands underlain by granite-gneiss and schist rock (Warne); residual material from weathered granite-gneiss rock (Worsham).	Light gray (Warne); light gray or medium gray (Worsham).	Light gray, streaked with dull yellow (Warne); brownish yellow or moderate yellow (Worsham).	Tough (Warne); friable (Worsham).

¹ Medium internal drainage refers to the optimum condition of internal drainage for most crops commonly grown in the county.

² The color of the surface soil of most of the eroded phases differs from that of the uneroded soil, owing to mixing by the plow of subsoil material with the remaining original surface soil.